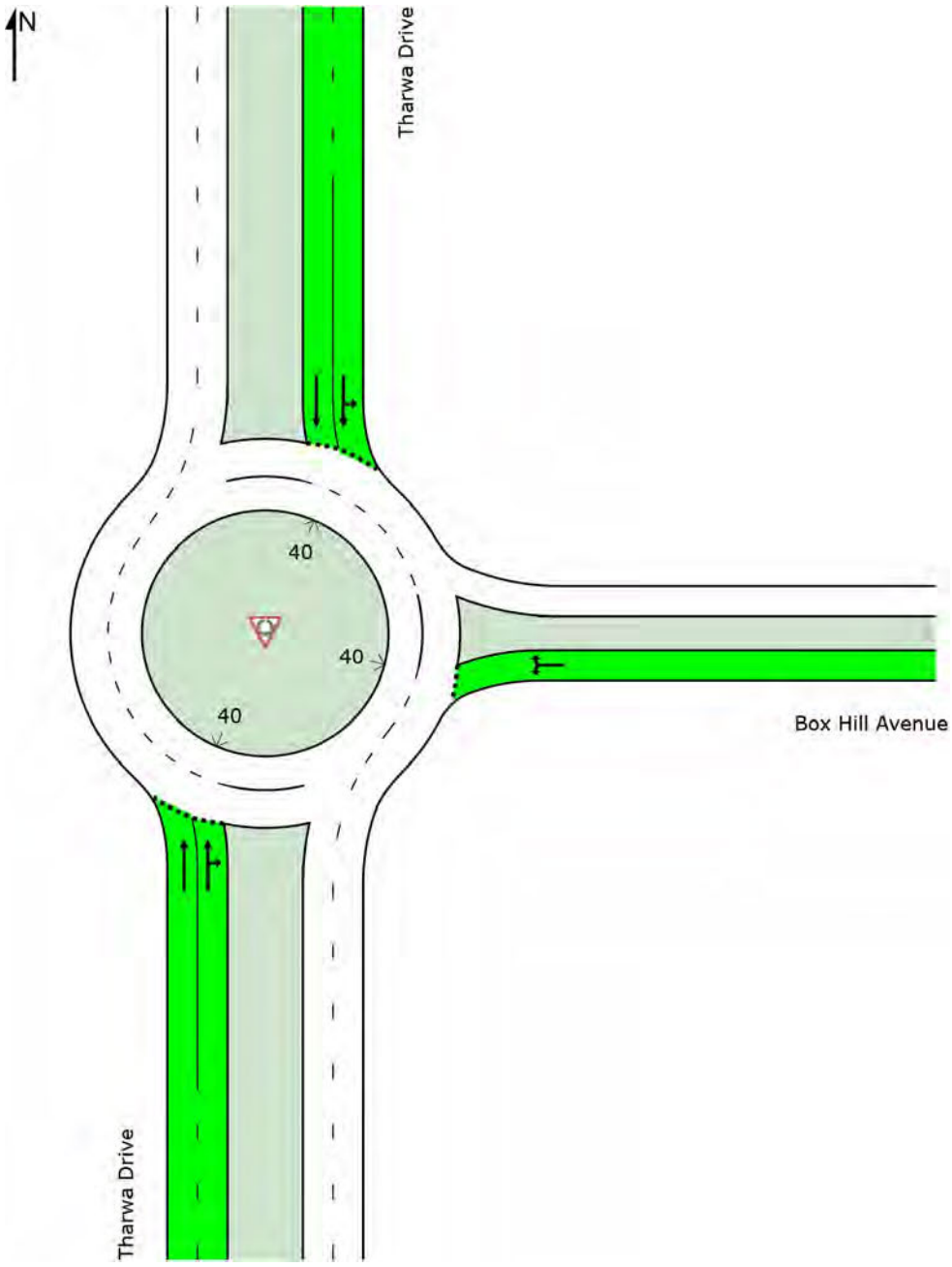
Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

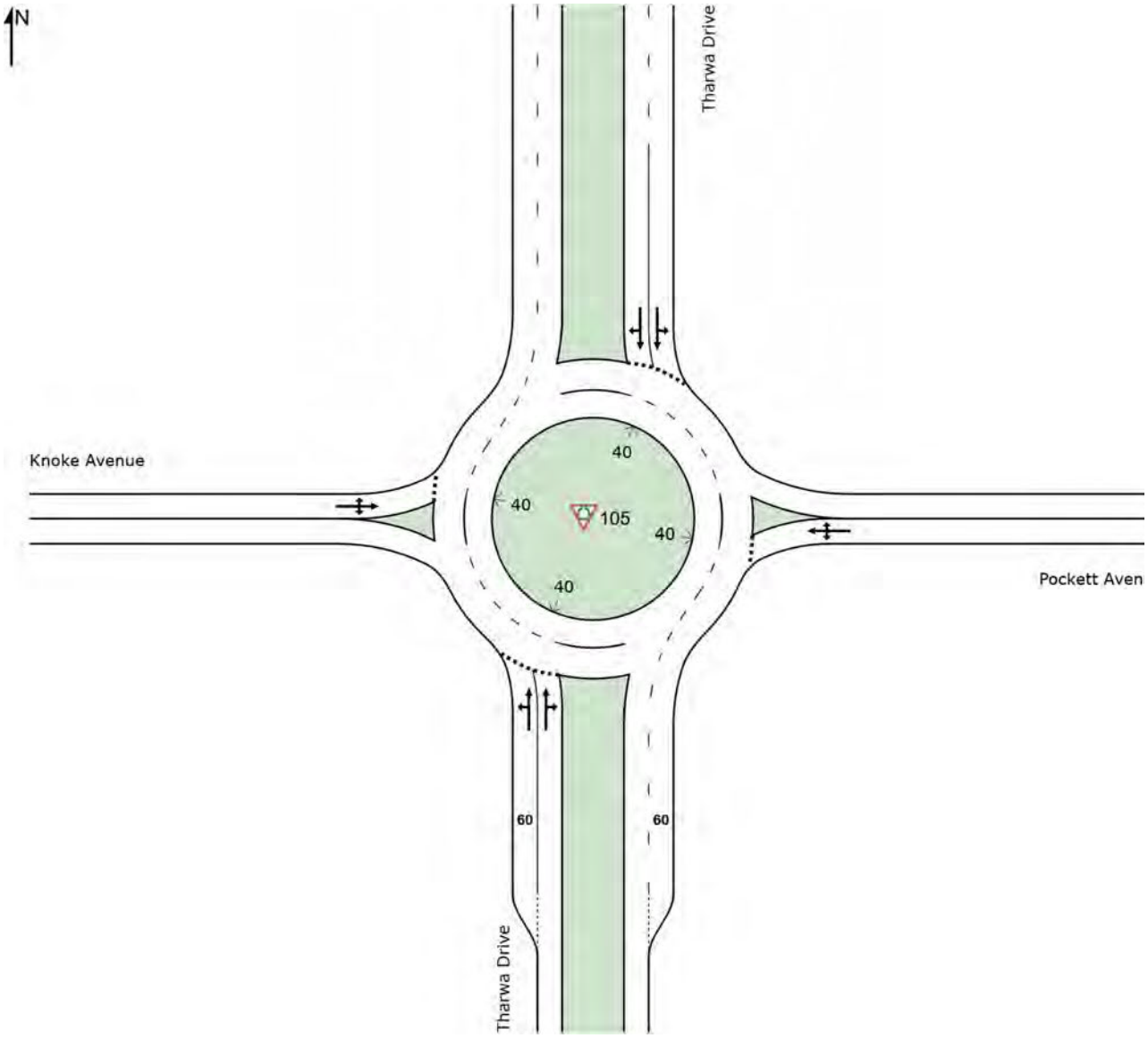
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 105 [2031_PM Peak_Tharwa Drive / Pockett Avenue - Roundabout]

Network: 13 [2031 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Dual Lane Roundabout - Duplicated
Site Category: PM Peak 2031 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.016	4.3	LOS A	0.0	0.2	0.41	0.41	0.41	52.7
2	T1	29	1.5	29	1.5	0.016	4.0	LOS A	0.0	0.2	0.41	0.44	0.41	50.6
3	R2	5	1.5	5	1.5	0.016	10.8	LOS A	0.0	0.2	0.42	0.50	0.42	48.6
Approach		37	1.5	37	1.5	0.016	5.0	LOS A	0.0	0.2	0.41	0.45	0.41	50.4
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.184	3.8	LOS A	0.3	2.4	0.39	0.63	0.39	49.1
5	T1	37	1.5	37	1.5	0.184	3.6	LOS A	0.3	2.4	0.39	0.63	0.39	14.7
6	R2	156	1.5	156	1.5	0.184	10.1	LOS A	0.3	2.4	0.39	0.63	0.39	30.9
Approach		203	1.5	203	1.5	0.184	8.6	LOS A	0.3	2.4	0.39	0.63	0.39	26.0
North: Tharwa Drive														
7	L2	303	1.5	303	1.5	0.189	3.3	LOS A	0.4	2.6	0.14	0.39	0.14	55.8
8	T1	61	1.5	61	1.5	0.187	2.9	LOS A	0.4	2.5	0.15	0.56	0.15	56.5
9	R2	205	1.5	205	1.5	0.187	9.6	LOS A	0.4	2.5	0.15	0.56	0.15	44.0
Approach		569	1.5	569	1.5	0.189	5.5	LOS A	0.4	2.6	0.15	0.47	0.15	51.0
West: Knoke Avenue														
10	L2	88	1.5	88	1.5	0.111	3.6	LOS A	0.2	1.4	0.31	0.43	0.31	37.1
11	T1	36	1.5	36	1.5	0.111	3.3	LOS A	0.2	1.4	0.31	0.43	0.31	28.8
12	R2	5	1.5	5	1.5	0.111	10.1	LOS A	0.2	1.4	0.31	0.43	0.31	58.2
Approach		129	1.5	129	1.5	0.111	3.8	LOS A	0.2	1.4	0.31	0.43	0.31	35.6
All Vehicles		939	1.5	939	1.5	0.189	5.9	LOS A	0.4	2.6	0.23	0.50	0.23	47.8

[redacted]

Lane Use and Performance

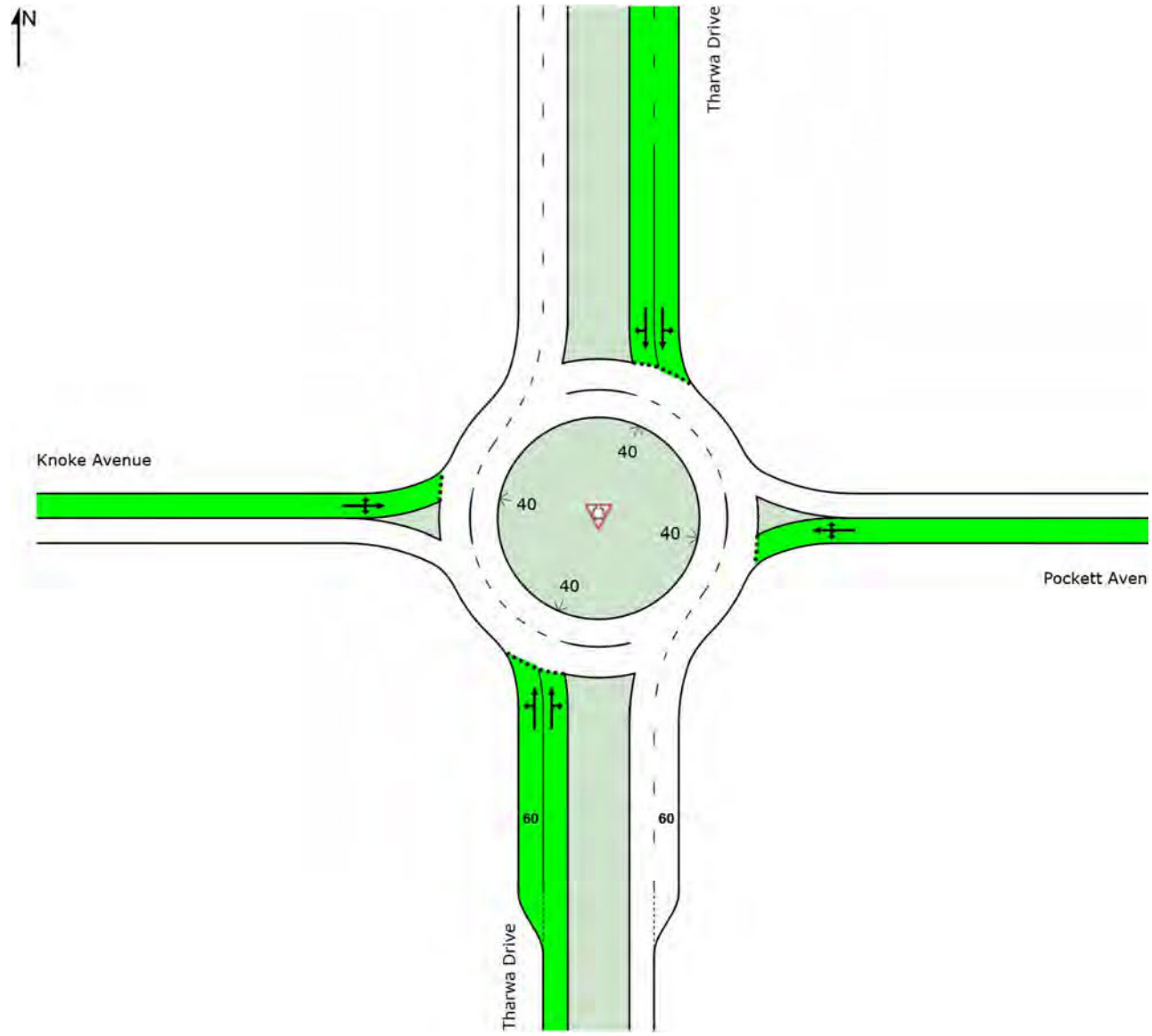
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	20	1.5	20	1.5	1237	0.016	100	3.9	LOS A	0.0	0.2	Short	60	0.0	NA
Lane 2	17	1.5	17	1.5	1081	0.016	100	6.1	LOS A	0.0	0.2	Full	500	0.0	0.0
Approach	37	1.5	37	1.5		0.016		5.0	LOS A	0.0	0.2				
East: Pockett Avenue															
Lane 1[d]	203	1.5	203	1.5	1107	0.184	100	8.6	LOS A	0.3	2.4	Full	80	0.0	0.0
Approach	203	1.5	203	1.5		0.184		8.6	LOS A	0.3	2.4				
North: Tharwa Drive															
Lane 1[d]	303	1.5	303	1.5	1603	0.189	100	3.3	LOS A	0.4	2.6	Full	990	0.0	0.0
Lane 2	266	1.5	266	1.5	1420	0.187	99[5]	8.0	LOS A	0.4	2.5	Full	990	0.0	0.0
Approach	569	1.5	569	1.5		0.189		5.5	LOS A	0.4	2.6				
West: Knoke Avenue															
Lane 1[d]	129	1.5	129	1.5	1163	0.111	100	3.8	LOS A	0.2	1.4	Full	95	0.0	0.0
Approach	129	1.5	129	1.5		0.111		3.8	LOS A	0.2	1.4				
Intersection	939	1.5	939	1.5		0.189		5.9	LOS A	0.4	2.6				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

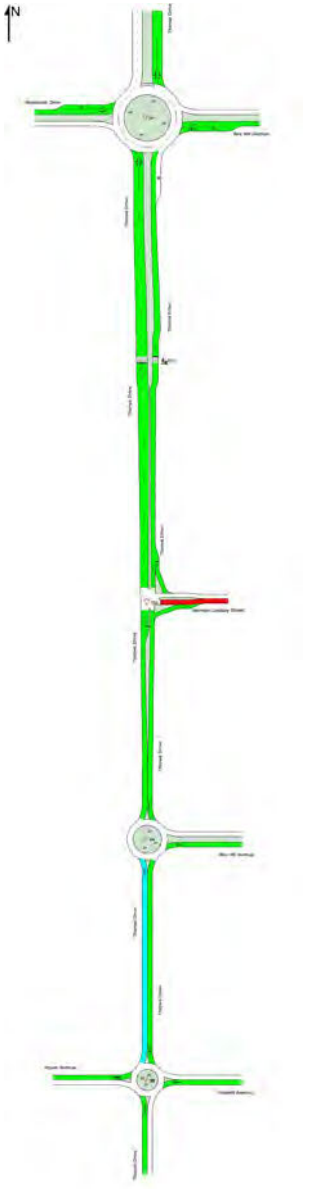
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions_Tharwa Drive AM peak - Base]

2041 Future Conditions - Existing Layout
Network Category: (None)



Colour code based on Degree of Saturation

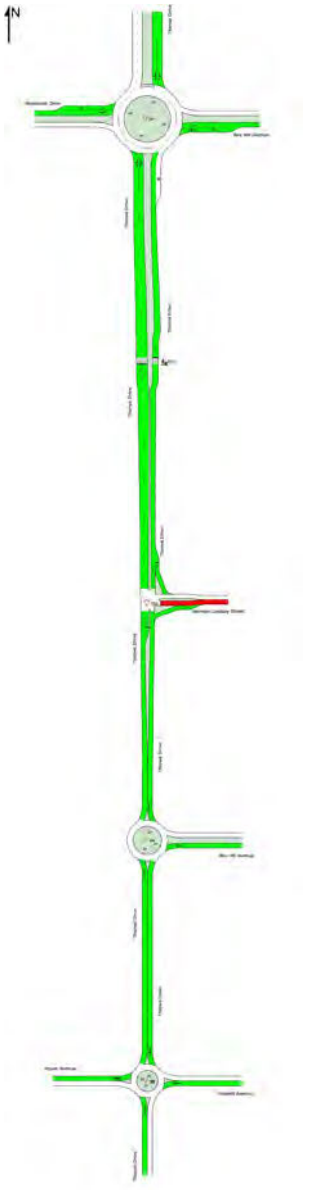
[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions_Tharwa Drive AM peak - Base]

2041 Future Conditions - Existing Layout
Network Category: (None)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

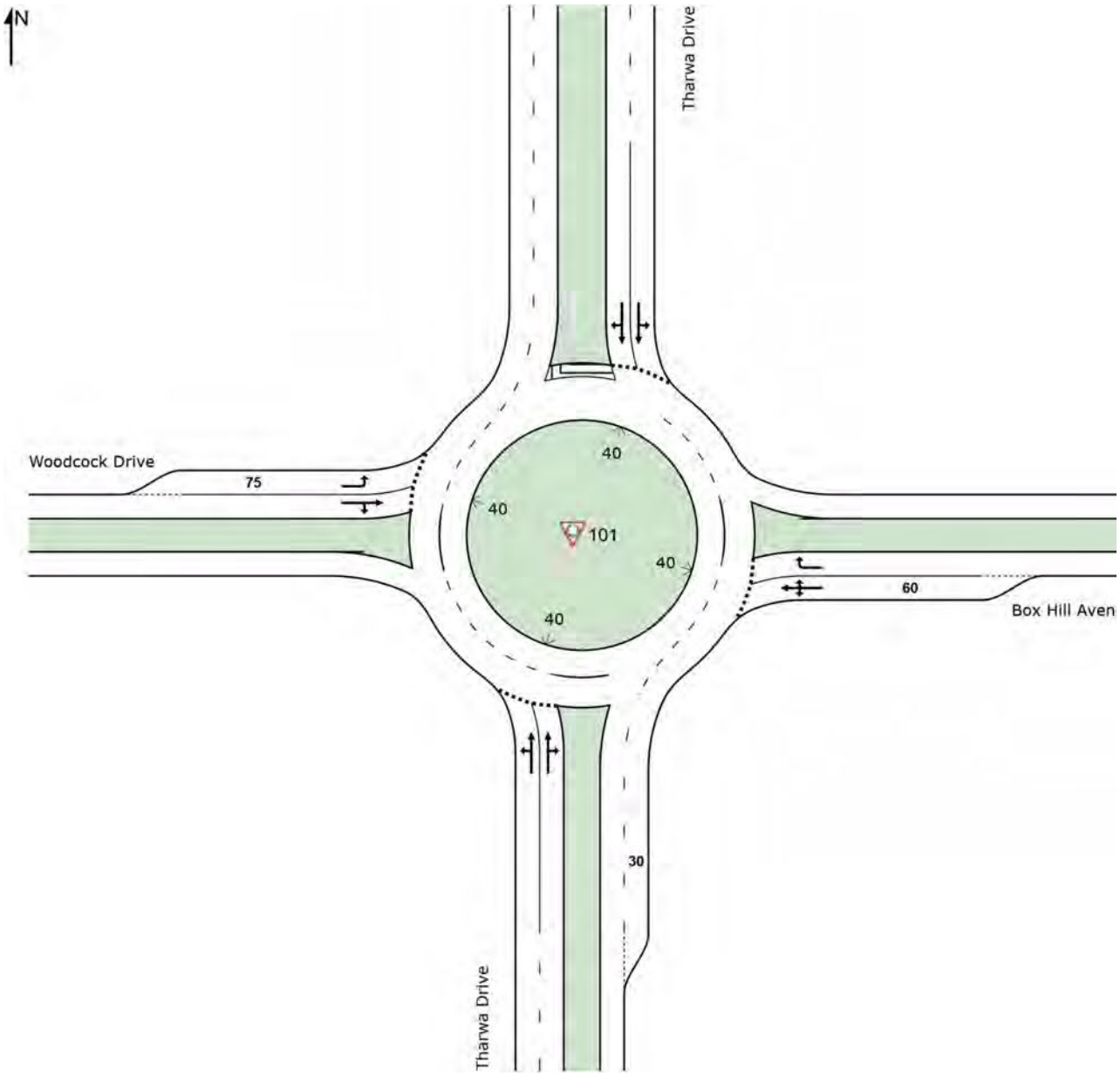
Template: Default Site User Report (2)

Site: 101 [2041_AM Peak_Tharwa Drive / Woodcock Drive - Base]

Network: 1 [2041 Future Conditions_Tharwa Drive AM peak - Base]

Two Lane Roundabout - Existing Layout
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	77	2.3	75	2.3	0.593	6.8	LOS A	1.7	11.9	0.76	0.83	0.93	48.5
2	T1	963	2.3	936	2.3	0.593	7.1	LOS A	1.7	11.9	0.76	0.87	0.95	53.1
3	R2	2	2.3	2	2.3	0.593	13.9	LOS A	1.6	11.1	0.76	0.91	0.97	38.8
Approach		1042	2.3	1013[N1]	2.3	0.593	7.1	LOS A	1.7	11.9	0.76	0.86	0.95	52.7
East: Box Hill Avenue														
4	L2	14	2.3	14	2.3	0.420	5.3	LOS A	1.1	7.6	0.62	0.71	0.62	33.6
5	T1	99	2.3	99	2.3	0.420	5.2	LOS A	1.1	7.6	0.62	0.71	0.62	49.0
6	R2	762	2.3	762	2.3	0.420	11.8	LOS A	1.1	7.6	0.63	0.75	0.63	50.4
Approach		875	2.3	875	2.3	0.420	10.9	LOS A	1.1	7.6	0.63	0.74	0.63	50.1
North: Tharwa Drive														
7	L2	369	2.3	369	2.3	0.290	4.0	LOS A	0.8	5.8	0.46	0.49	0.46	53.2
8	T1	351	2.3	351	2.3	0.268	3.2	LOS A	0.8	5.5	0.43	0.40	0.43	50.4
9	R2	68	2.3	68	2.3	0.268	10.1	LOS A	0.8	5.5	0.43	0.40	0.43	57.2
Approach		788	2.3	788	2.3	0.290	4.2	LOS A	0.8	5.8	0.45	0.44	0.45	52.5
West: Woodcock Drive														
10	L2	125	2.3	125	2.3	0.225	8.2	LOS A	0.4	2.9	0.75	0.85	0.75	52.3
11	T1	136	2.3	136	2.3	0.237	6.1	LOS A	0.5	3.5	0.77	0.73	0.77	50.6
12	R2	58	2.3	58	2.3	0.237	13.0	LOS A	0.5	3.5	0.77	0.73	0.77	44.4
Approach		319	2.3	319	2.3	0.237	8.2	LOS A	0.5	3.5	0.76	0.78	0.76	50.6
All Vehicles		3024	2.3	2995[N1]	2.3	0.593	7.6	LOS A	1.7	11.9	0.64	0.71	0.70	51.6

[redacted]

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Use and Performance

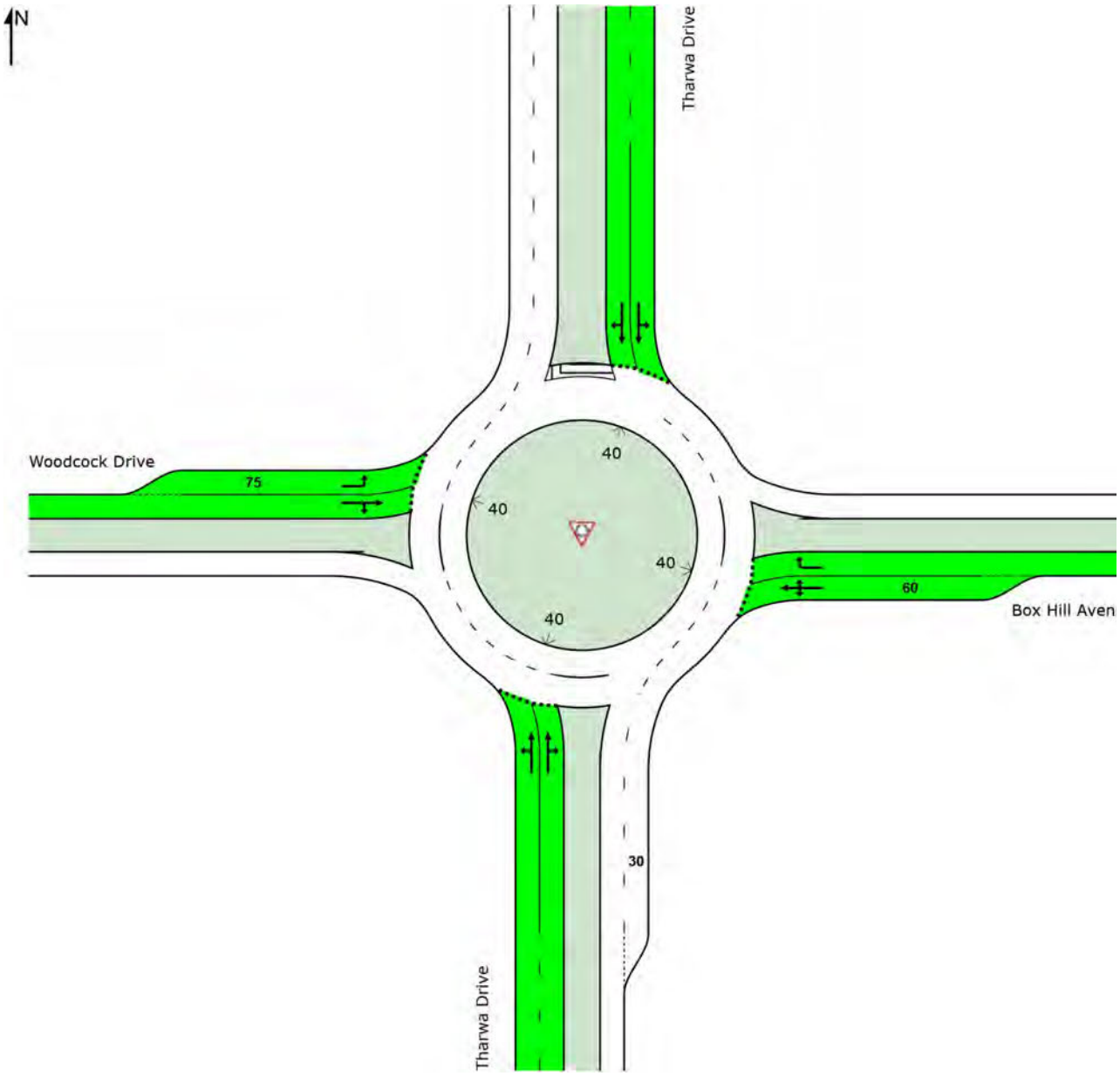
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	582	2.3	566	2.3	954	0.593	100	6.6	LOS A	1.7	11.9	Full	75	0.0	0.0
Lane 2	460	2.3	447	2.3	753	0.593	100	7.8	LOS A	1.6	11.1	Full	75	0.0	0.0
Approach	1042	2.3	1013[N1]	2.3		0.593		7.1	LOS A	1.7	11.9				
East: Box Hill Avenue															
Lane 1[d]	473	2.3	473	2.3	1128	0.420	100	10.0	LOS A	1.1	7.6	Short	60	0.0	NA
Lane 2	401	2.3	401	2.3	956	0.420	100	12.0	LOS A	1.0	7.2	Full	150	0.0	0.0
Approach	875	2.3	875	2.3		0.420		10.9	LOS A	1.1	7.6				
North: Tharwa Drive															
Lane 1	369	2.3	369	2.3	1274	0.290	100	4.0	LOS A	0.8	5.8	Full	490	0.0	0.0
Lane 2[d]	419	2.3	419	2.3	1565	0.268	92[5]	4.3	LOS A	0.8	5.5	Full	490	0.0	0.0
Approach	788	2.3	788	2.3		0.290		4.2	LOS A	0.8	5.8				
West: Woodcock Drive															
Lane 1	125	2.3	125	2.3	557	0.225	100	8.2	LOS A	0.4	2.9	Short	75	0.0	NA
Lane 2[d]	194	2.3	194	2.3	817	0.237	100	8.1	LOS A	0.5	3.5	Full	380	0.0	0.0
Approach	319	2.3	319	2.3		0.237		8.2	LOS A	0.5	3.5				
Intersection	3024	2.3	2995[N1]	2.3		0.593		7.6	LOS A	1.7	11.9				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

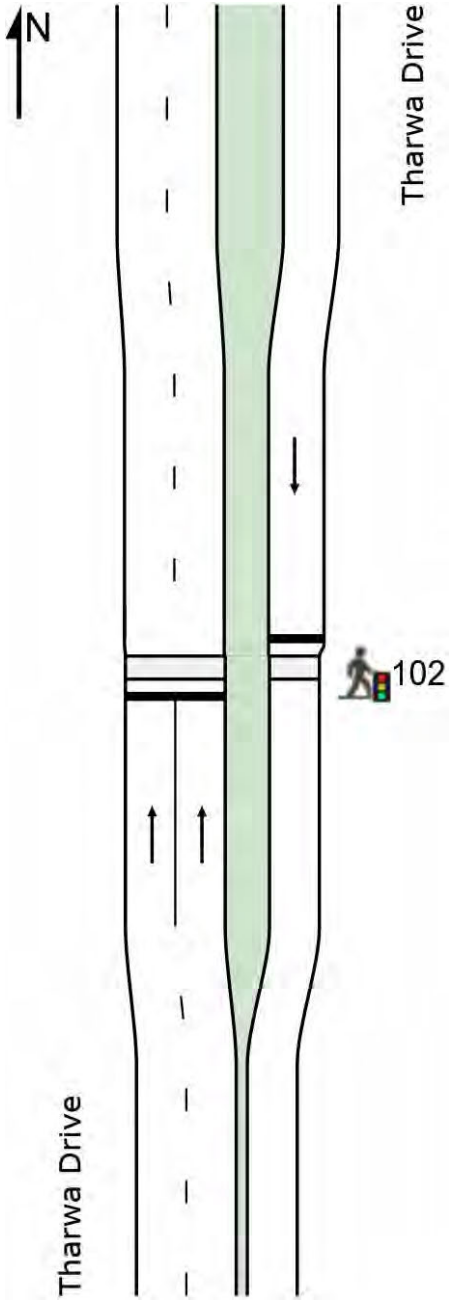
Site: 102 [2041_AM Peak_Tharwa Drive Pedestrian Crossing - Base]

Network: 1 [2041 Future Conditions_Tharwa Drive AM peak - Base]

Pedestrian Crossing - Existing Layout
Site Category: AM Peak 2041 Conditions
Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 133 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	1042	2.3	1013	2.3	0.277	1.0	LOS A	2.7	19.5	0.15	0.14	0.15	50.5
Approach		1042	2.3	1013[N1]	2.3	0.277	1.0	LOS A	2.7	19.5	0.15	0.14	0.15	50.5
North: Tharwa Drive														
8	T1	422	2.3	422	2.3	0.226	1.0	LOS A	2.1	15.3	0.14	0.13	0.14	50.5
Approach		422	2.3	422	2.3	0.226	1.0	LOS A	2.1	15.3	0.14	0.13	0.14	50.5
All Vehicles		1464	2.3	1435[N1]	2.3	0.277	1.0	LOS A	2.7	19.5	0.15	0.13	0.15	50.5

[redacted]

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Use and Performance

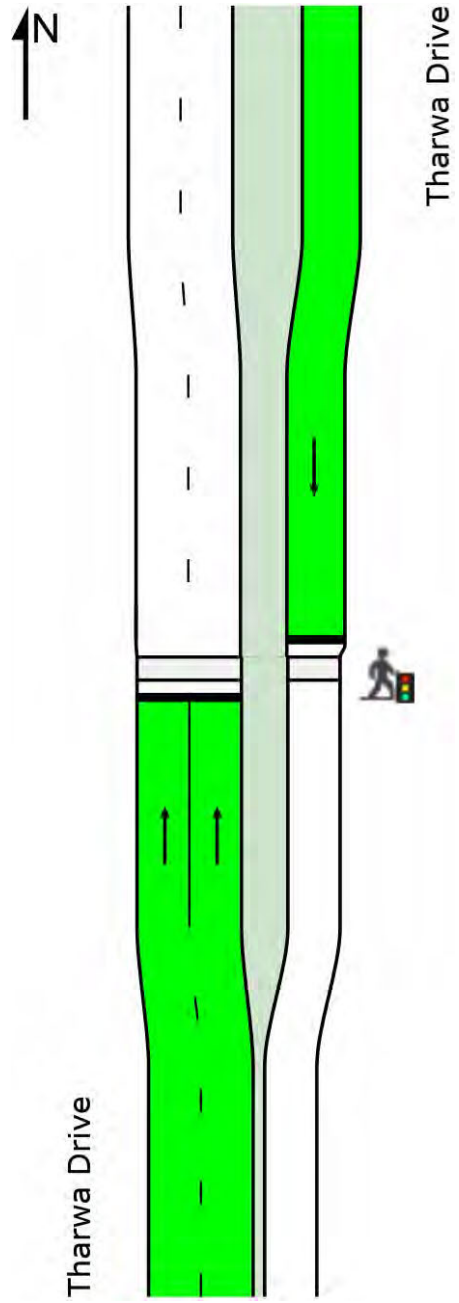
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	521	2.3	506	2.3	1826	0.277	100	1.0	LOS A	2.7	19.5	Full	80	0.0	0.0
Lane 2	521	2.3	506	2.3	1826	0.277	100	1.0	LOS A	2.7	19.5	Full	80	0.0	0.0
Approach	1042	2.3	1013[N1]	2.3		0.277		1.0	LOS A	2.7	19.5				
North: Tharwa Drive															
Lane 1	422	2.3	422	2.3	1871	0.226	100	1.0	LOS A	2.1	15.3	Full	75	0.0	0.0
Approach	422	2.3	422	2.3		0.226		1.0	LOS A	2.1	15.3				
Intersection	1464	2.3	1435[N1]	2.3		0.277		1.0	LOS A	2.7	19.5				

[redacted]

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Level of Service

	Approaches		Intersection
	South	North	
LOS	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

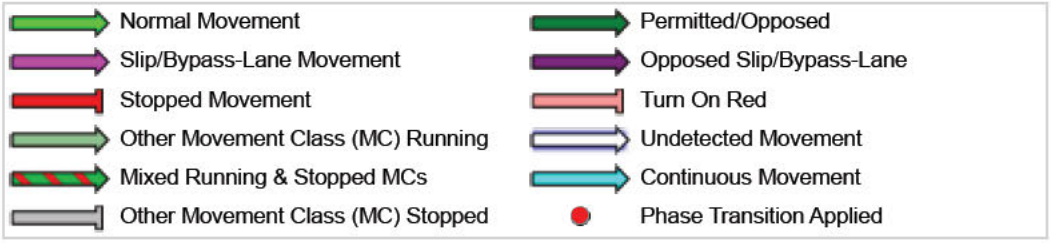
Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	122
Green Time (sec)	119	5
Phase Time (sec)	125	8
Phase Split	94%	6%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

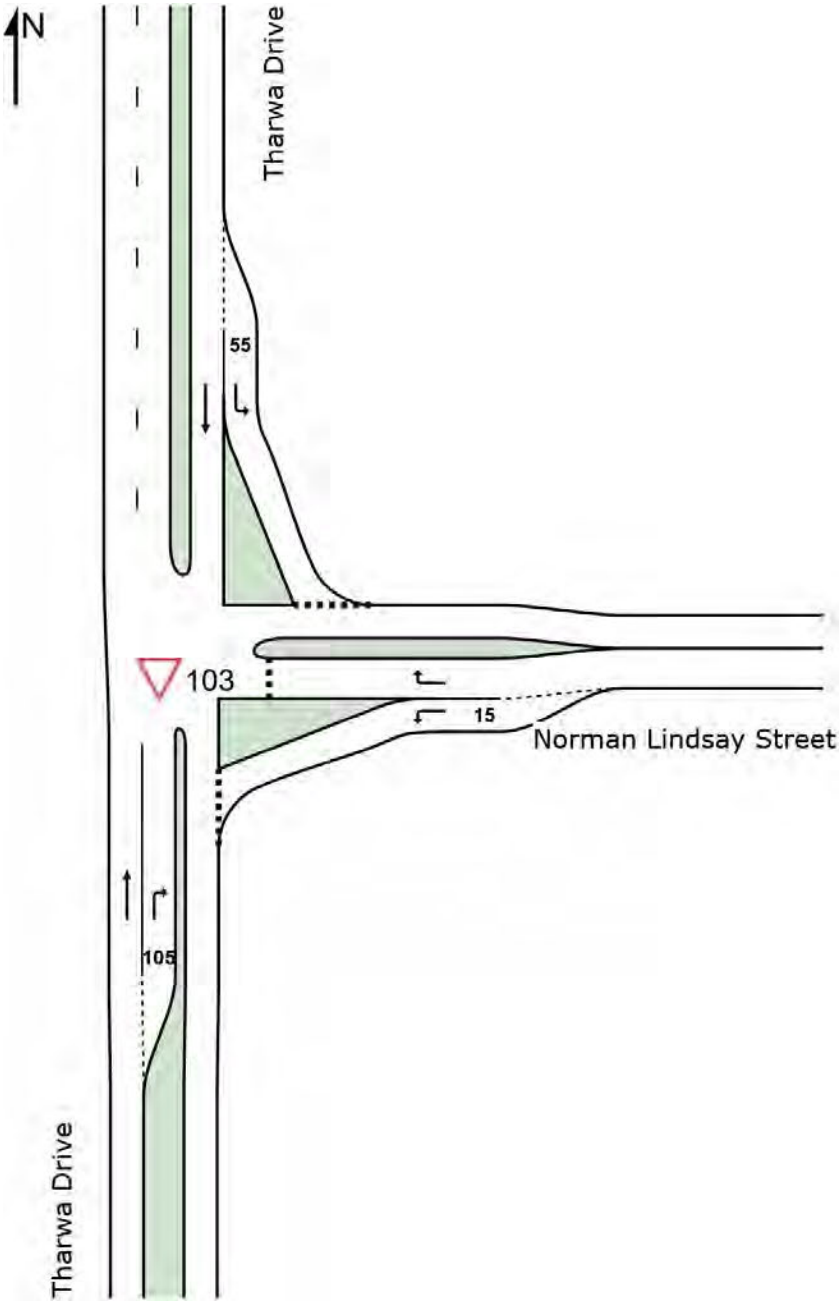


Site: 103 [2041_AM Peak_Tharwa Drive / Norman Lindsay Street - Base]

Network: 1 [2041 Future Conditions_Tharwa Drive AM peak - Base]

Priority-Controlled T-Intersection - Existing Layout
Site Category: AM Peak 2041 Conditions
Giveway / Yield (Two-Way)

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	889	2.3	889	2.3	0.466	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	151	2.3	151	2.3	0.110	6.6	LOS A	0.2	1.5	0.39	0.60	0.39	49.0
Approach		1040	2.3	1040	2.3	0.466	1.0	NA	0.2	1.5	0.06	0.09	0.06	57.9
East: Norman Lindsay Street														
4	L2	79	2.3	79	2.3	0.063	4.6	LOS A	0.1	0.7	0.35	0.56	0.35	26.4
6	R2	152	2.3	152	2.3	1.238	287.3	LOS F	9.7	69.4	1.00	2.52	7.36	0.6
Approach		231	2.3	231	2.3	1.238	190.5	LOS F	9.7	69.4	0.78	1.85	4.96	1.0
North: Tharwa Drive														
7	L2	143	2.3	143	2.3	0.101	5.7	LOS A	0.2	1.2	0.25	0.54	0.25	30.9
8	T1	280	2.3	280	2.3	0.146	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		423	2.3	423	2.3	0.146	1.9	LOS A	0.2	1.2	0.08	0.18	0.08	42.5
All Vehicles		1694	2.3	1694	2.3	1.238	27.0	NA	9.7	69.4	0.16	0.35	0.73	29.1

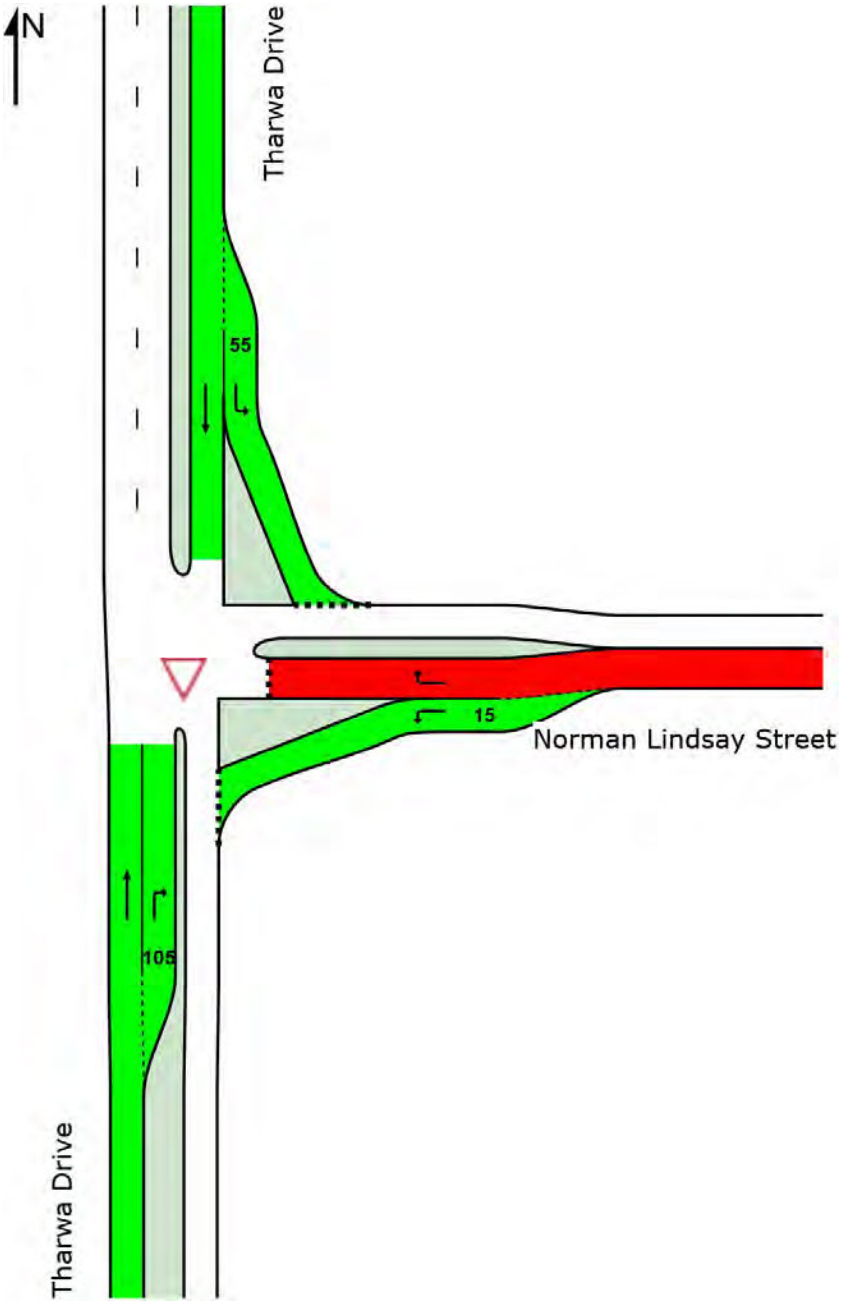
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	889	2.3	889	2.3	1910	0.466	100	0.1	LOS A	0.0	0.0	Full	640	0.0	0.0
Lane 2	151	2.3	151	2.3	1369	0.110	100	6.6	LOS A	0.2	1.5	Short	105	0.0	NA
Approach	1040	2.3	1040	2.3		0.466		1.0	NA	0.2	1.5				
East: Norman Lindsay Street															
Lane 1	79	2.3	79	2.3	1254	0.063	100	4.6	LOS A	0.1	0.7	Short	15	0.0	NA
Lane 2	152	2.3	152	2.3	122	1.238	100	287.3	LOS F	9.7	69.4	Full	40	0.0	100.0
Approach	231	2.3	231	2.3		1.238		190.5	LOS F	9.7	69.4				
North: Tharwa Drive															
Lane 1	143	2.3	143	2.3	1419	0.101	100	5.7	LOS A	0.2	1.2	Short	55	0.0	NA
Lane 2	280	2.3	280	2.3	1921	0.146	100	0.0	LOS A	0.0	0.0	Full	80	0.0	0.0
Approach	423	2.3	423	2.3		0.146		1.9	LOS A	0.2	1.2				
Intersection	1694	2.3	1694	2.3		1.238		27.0	NA	9.7	69.4				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	NA	F	A	NA



Colour code based on Level of Service

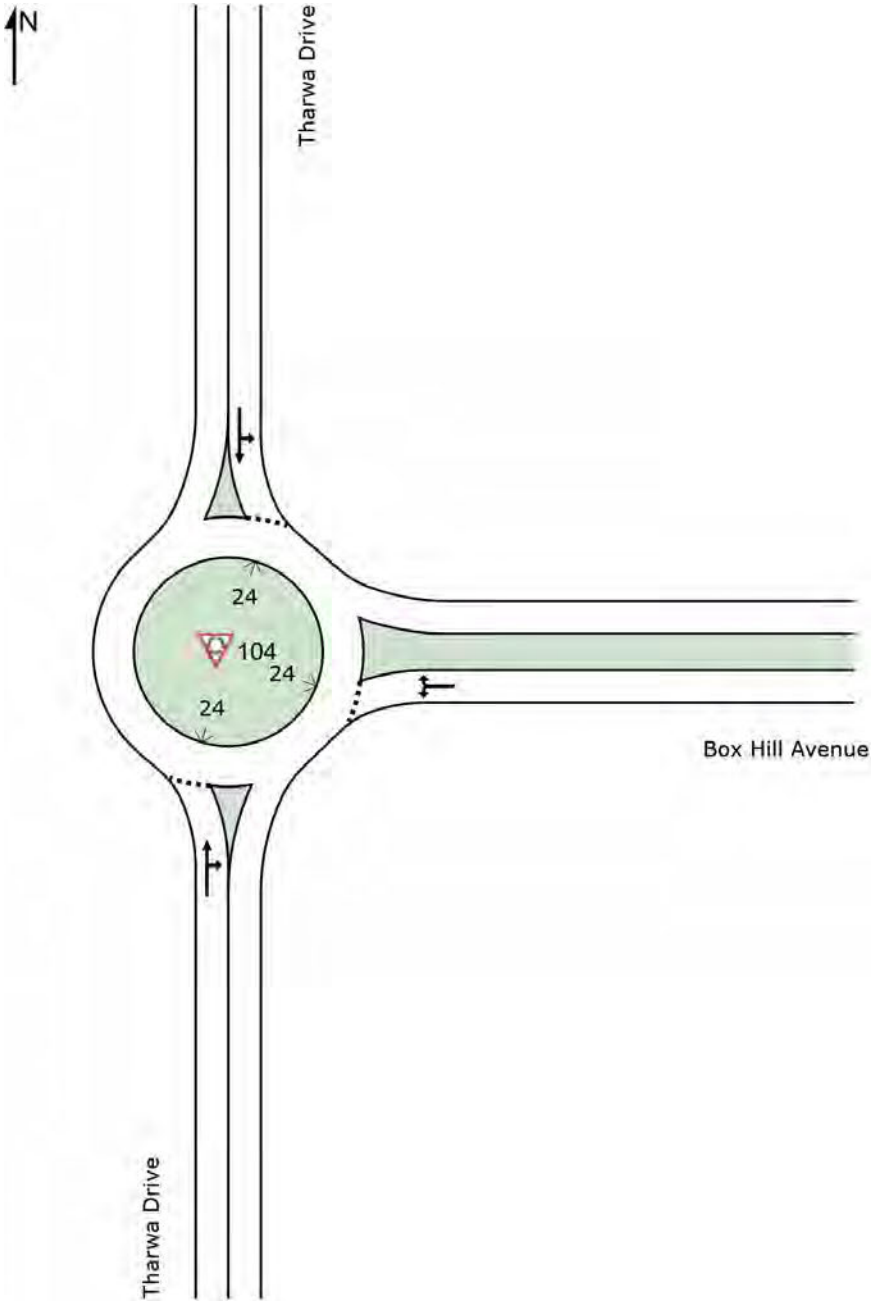
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 104 [2041_AM Peak_Tharwa Drive / Box Hill Avenue - Base]

Network: 1 [2041 Future Conditions_Tharwa Drive AM peak - Base]

Single Lane Roundabout - Existing Layout
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	491	2.3	491	2.3	0.625	10.5	LOS A	2.6	18.4	0.87	0.95	1.09	51.0
3	R2	48	2.3	48	2.3	0.625	15.7	LOS B	2.6	18.4	0.87	0.95	1.09	50.2
Approach		539	2.3	539	2.3	0.625	10.9	LOS A	2.6	18.4	0.87	0.95	1.09	50.9
East: Box Hill Avenue														
4	L2	19	2.3	19	2.3	0.444	4.7	LOS A	1.3	9.2	0.45	0.64	0.45	28.5
6	R2	552	2.3	552	2.3	0.444	10.0	LOS A	1.3	9.2	0.45	0.64	0.45	28.5
Approach		571	2.3	571	2.3	0.444	9.8	LOS A	1.3	9.2	0.45	0.64	0.45	28.5
North: Tharwa Drive														
7	L2	186	2.3	186	2.3	0.240	4.0	LOS A	0.7	4.9	0.23	0.42	0.23	53.4
8	T1	161	2.3	161	2.3	0.240	4.1	LOS A	0.7	4.9	0.23	0.42	0.23	53.4
Approach		347	2.3	347	2.3	0.240	4.0	LOS A	0.7	4.9	0.23	0.42	0.23	53.4
All Vehicles		1457	2.3	1457	2.3	0.625	8.8	LOS A	2.6	18.4	0.55	0.70	0.63	47.7

[redacted]

Lane Use and Performance

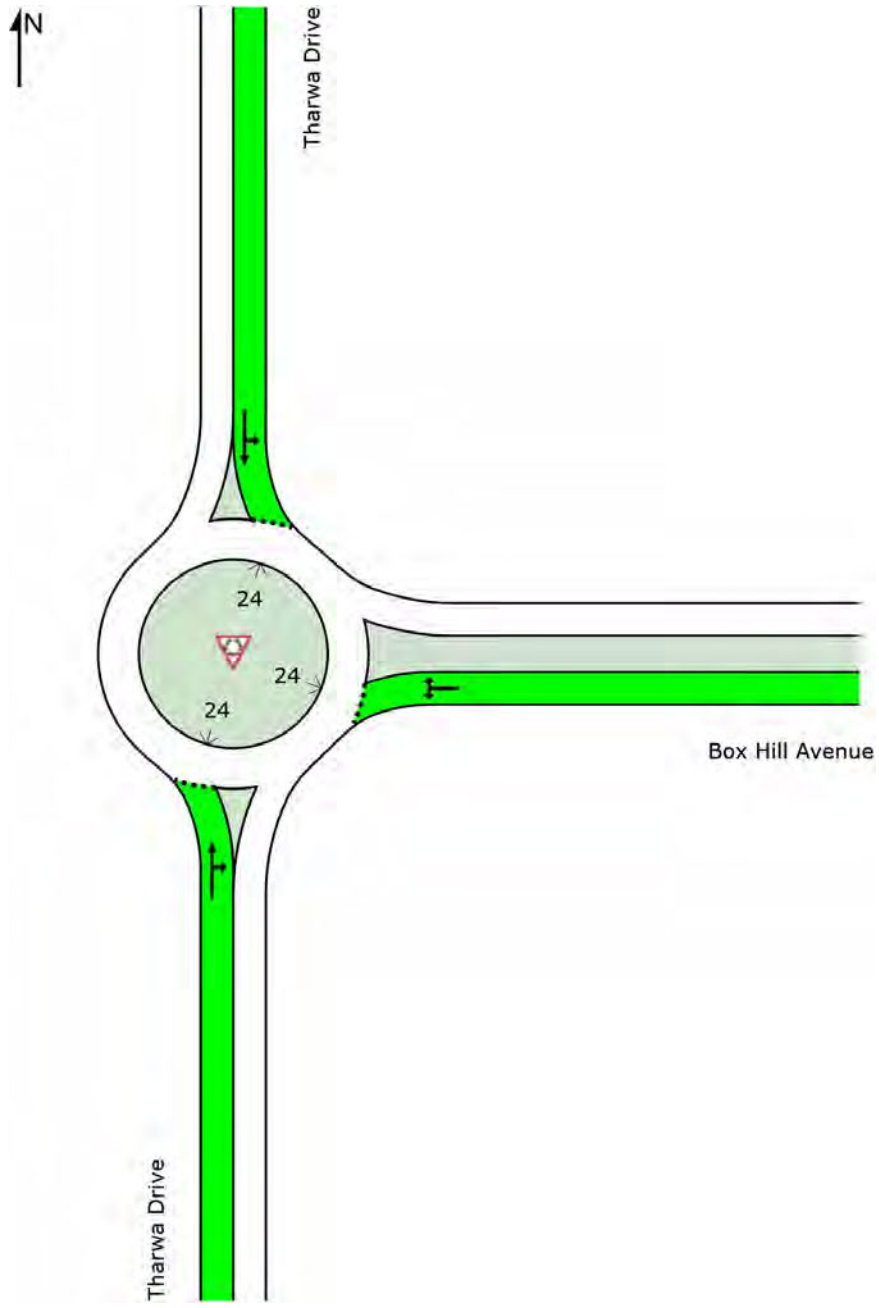
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	539	2.3	539	2.3	862	0.625	100	10.9	LOS A	2.6	18.4	Full	990	0.0	0.0
Approach	539	2.3	539	2.3		0.625		10.9	LOS A	2.6	18.4				
East: Box Hill Avenue															
Lane 1[d]	571	2.3	571	2.3	1285	0.444	100	9.8	LOS A	1.3	9.2	Full	105	0.0	0.0
Approach	571	2.3	571	2.3		0.444		9.8	LOS A	1.3	9.2				
North: Tharwa Drive															
Lane 1[d]	347	2.3	347	2.3	1447	0.240	100	4.0	LOS A	0.7	4.9	Full	640	0.0	0.0
Approach	347	2.3	347	2.3		0.240		4.0	LOS A	0.7	4.9				
Intersection	1457	2.3	1457	2.3		0.625		8.8	LOS A	2.6	18.4				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

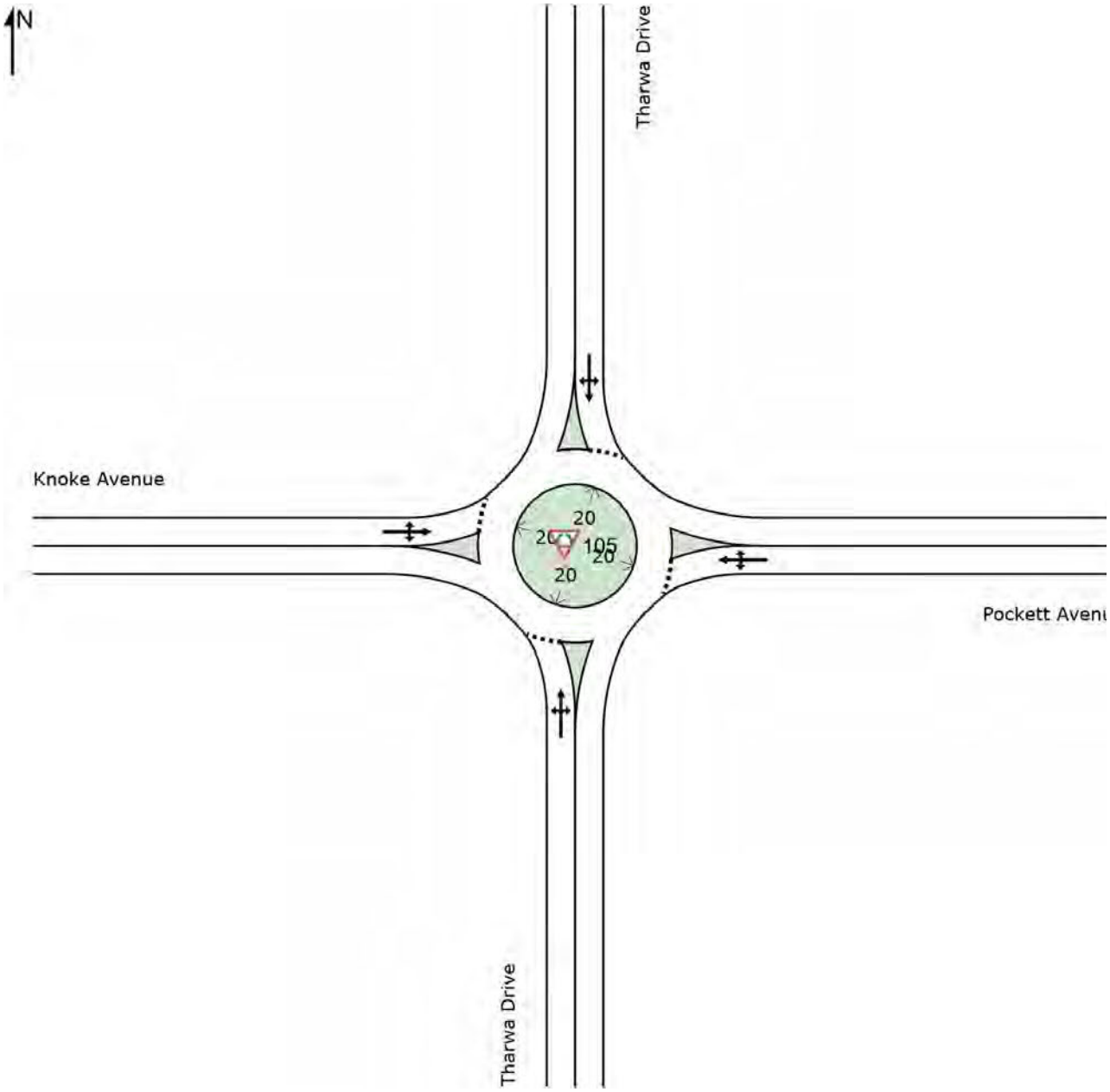
[redacted]

Site: 105 [2041_AM Peak_Tharwa Drive / Pockett Avenue - Base]

Network: 1 [2041 Future Conditions_Tharwa Drive AM peak - Base]

Single-Lane Roundabout - Existing Layout
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	1	2.3	1	2.3	0.051	5.6	LOS A	0.1	0.8	0.48	0.53	0.48	49.5
2	T1	51	2.3	51	2.3	0.051	5.8	LOS A	0.1	0.8	0.48	0.53	0.48	49.2
3	R2	1	2.3	1	2.3	0.051	10.5	LOS A	0.1	0.8	0.48	0.53	0.48	47.7
Approach		53	2.3	53	2.3	0.051	5.9	LOS A	0.1	0.8	0.48	0.53	0.48	49.2
East: Pockett Avenue														
4	L2	2	2.3	2	2.3	0.232	3.9	LOS A	0.5	3.8	0.28	0.61	0.28	47.5
5	T1	27	2.3	27	2.3	0.232	4.2	LOS A	0.5	3.8	0.28	0.61	0.28	12.8
6	R2	281	2.3	281	2.3	0.232	8.8	LOS A	0.5	3.8	0.28	0.61	0.28	27.9
Approach		311	2.3	311	2.3	0.232	8.4	LOS A	0.5	3.8	0.28	0.61	0.28	24.2
North: Tharwa Drive														
7	L2	74	2.3	74	2.3	0.117	4.0	LOS A	0.3	1.9	0.15	0.51	0.15	45.6
8	T1	36	2.3	36	2.3	0.117	4.3	LOS A	0.3	1.9	0.15	0.51	0.15	56.6
9	R2	59	2.3	59	2.3	0.117	8.9	LOS A	0.3	1.9	0.15	0.51	0.15	45.4
Approach		168	2.3	168	2.3	0.117	5.8	LOS A	0.3	1.9	0.15	0.51	0.15	48.0
West: Knoke Avenue														
10	L2	199	2.3	199	2.3	0.221	5.7	LOS A	0.5	3.6	0.52	0.61	0.52	31.2
11	T1	31	2.3	31	2.3	0.221	5.9	LOS A	0.5	3.6	0.52	0.61	0.52	23.6
12	R2	3	2.3	3	2.3	0.221	10.6	LOS A	0.5	3.6	0.52	0.61	0.52	52.0
Approach		233	2.3	233	2.3	0.221	5.8	LOS A	0.5	3.6	0.52	0.61	0.52	30.1
All Vehicles		764	2.3	764	2.3	0.232	6.9	LOS A	0.5	3.8	0.34	0.58	0.34	40.0

Lane Use and Performance

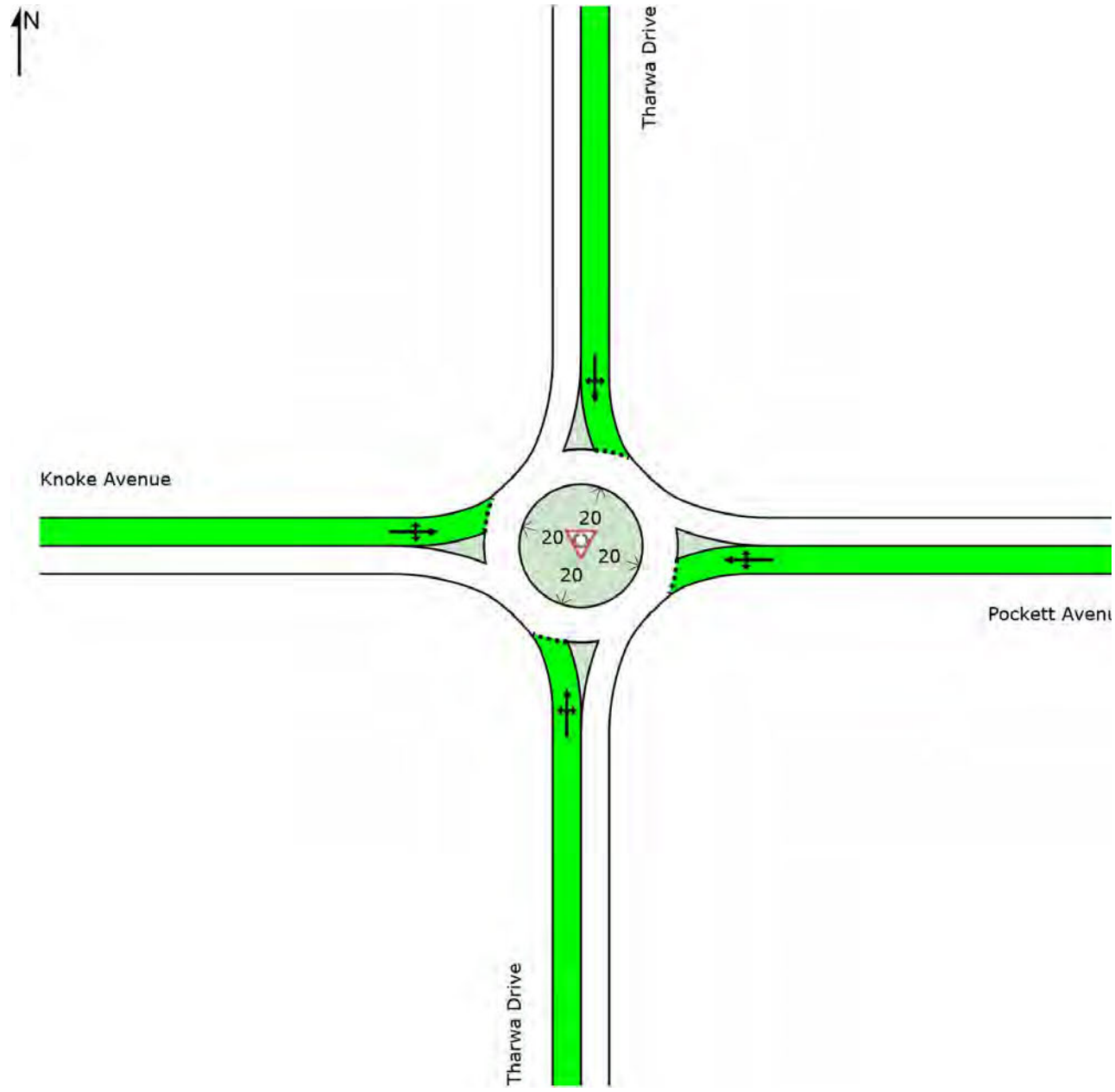
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	53	2.3	53	2.3	1024	0.051	100	5.9	LOS A	0.1	0.8	Full	500	0.0	0.0
Approach	53	2.3	53	2.3		0.051		5.9	LOS A	0.1	0.8				
East: Pockett Avenue															
Lane 1[d]	311	2.3	311	2.3	1338	0.232	100	8.4	LOS A	0.5	3.8	Full	80	0.0	0.0
Approach	311	2.3	311	2.3		0.232		8.4	LOS A	0.5	3.8				
North: Tharwa Drive															
Lane 1[d]	168	2.3	168	2.3	1440	0.117	100	5.8	LOS A	0.3	1.9	Full	990	0.0	0.0
Approach	168	2.3	168	2.3		0.117		5.8	LOS A	0.3	1.9				
West: Knoke Avenue															
Lane 1[d]	233	2.3	233	2.3	1051	0.221	100	5.8	LOS A	0.5	3.6	Full	95	0.0	0.0
Approach	233	2.3	233	2.3		0.221		5.8	LOS A	0.5	3.6				
Intersection	764	2.3	764	2.3		0.232		6.9	LOS A	0.5	3.8				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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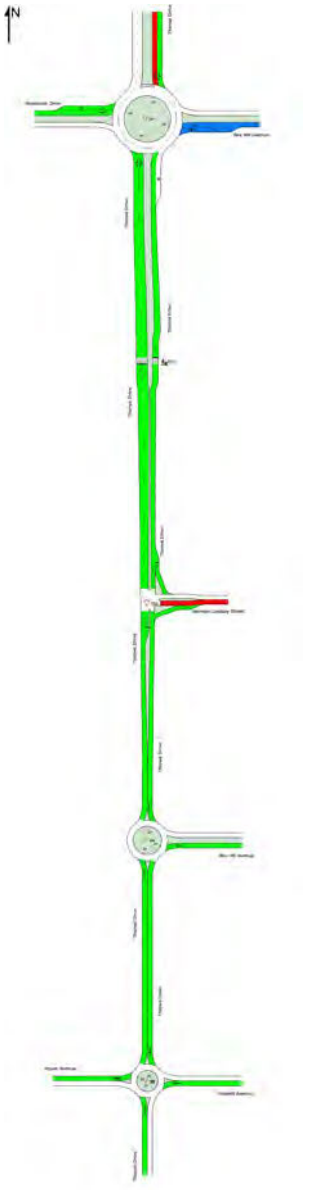
LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions_Tharwa Drive PM peak - Base]

2041 Future PM Peak Conditions - Existing Layout
Network Category: (None)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

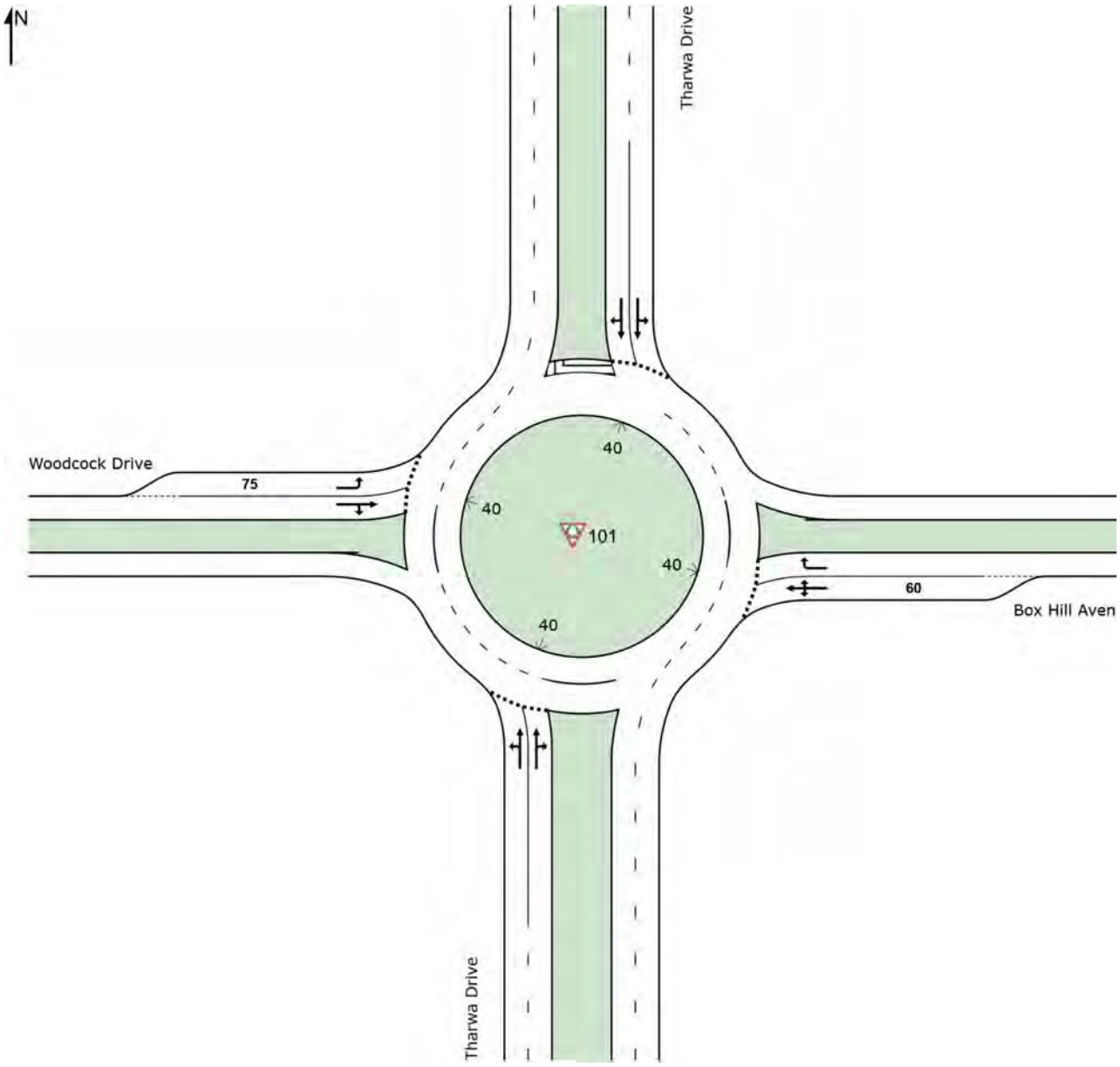
Template: Default Site User Report (2)

Site: 101 [2041_AM Peak_Tharwa Drive / Woodcock Drive - Duplicated]

Network: 4 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

Two Lane Roundabout - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	77	2.3	77	2.3	0.603	7.2	LOS A	1.5	10.9	0.69	0.76	0.84	49.3
2	T1	963	2.3	963	2.3	0.603	7.4	LOS A	1.5	10.9	0.71	0.81	0.86	53.4
3	R2	2	2.3	2	2.3	0.603	14.4	LOS A	1.4	10.0	0.72	0.86	0.89	42.0
Approach		1042	2.3	1042	2.3	0.603	7.4	LOS A	1.5	10.9	0.70	0.80	0.86	53.1
East: Box Hill Avenue														
4	L2	14	2.3	14	2.3	0.406	4.8	LOS A	0.9	6.4	0.56	0.70	0.56	34.0
5	T1	99	2.3	99	2.3	0.406	4.7	LOS A	0.9	6.4	0.56	0.70	0.56	49.3
6	R2	762	2.3	762	2.3	0.406	11.3	LOS A	0.9	6.4	0.57	0.74	0.57	50.7
Approach		875	2.3	875	2.3	0.406	10.4	LOS A	0.9	6.4	0.57	0.73	0.57	50.4
North: Tharwa Drive														
7	L2	369	2.3	369	2.3	0.279	3.7	LOS A	0.8	5.8	0.44	0.45	0.44	53.3
8	T1	351	2.3	351	2.3	0.279	3.4	LOS A	0.8	5.8	0.46	0.44	0.46	50.2
9	R2	68	2.3	68	2.3	0.279	10.4	LOS A	0.8	5.5	0.46	0.43	0.46	56.9
Approach		788	2.3	788	2.3	0.279	4.2	LOS A	0.8	5.8	0.45	0.44	0.45	52.5
West: Woodcock Drive														
10	L2	125	2.3	125	2.3	0.219	8.4	LOS A	0.4	3.0	0.77	0.86	0.77	52.1
11	T1	136	2.3	136	2.3	0.233	6.3	LOS A	0.5	3.7	0.79	0.75	0.79	50.4
12	R2	58	2.3	58	2.3	0.233	13.3	LOS A	0.5	3.7	0.79	0.75	0.79	44.2
Approach		319	2.3	319	2.3	0.233	8.4	LOS A	0.5	3.7	0.78	0.79	0.78	50.4
All Vehicles		3024	2.3	3024	2.3	0.603	7.5	LOS A	1.5	10.9	0.61	0.69	0.66	51.8

Lane Use and Performance

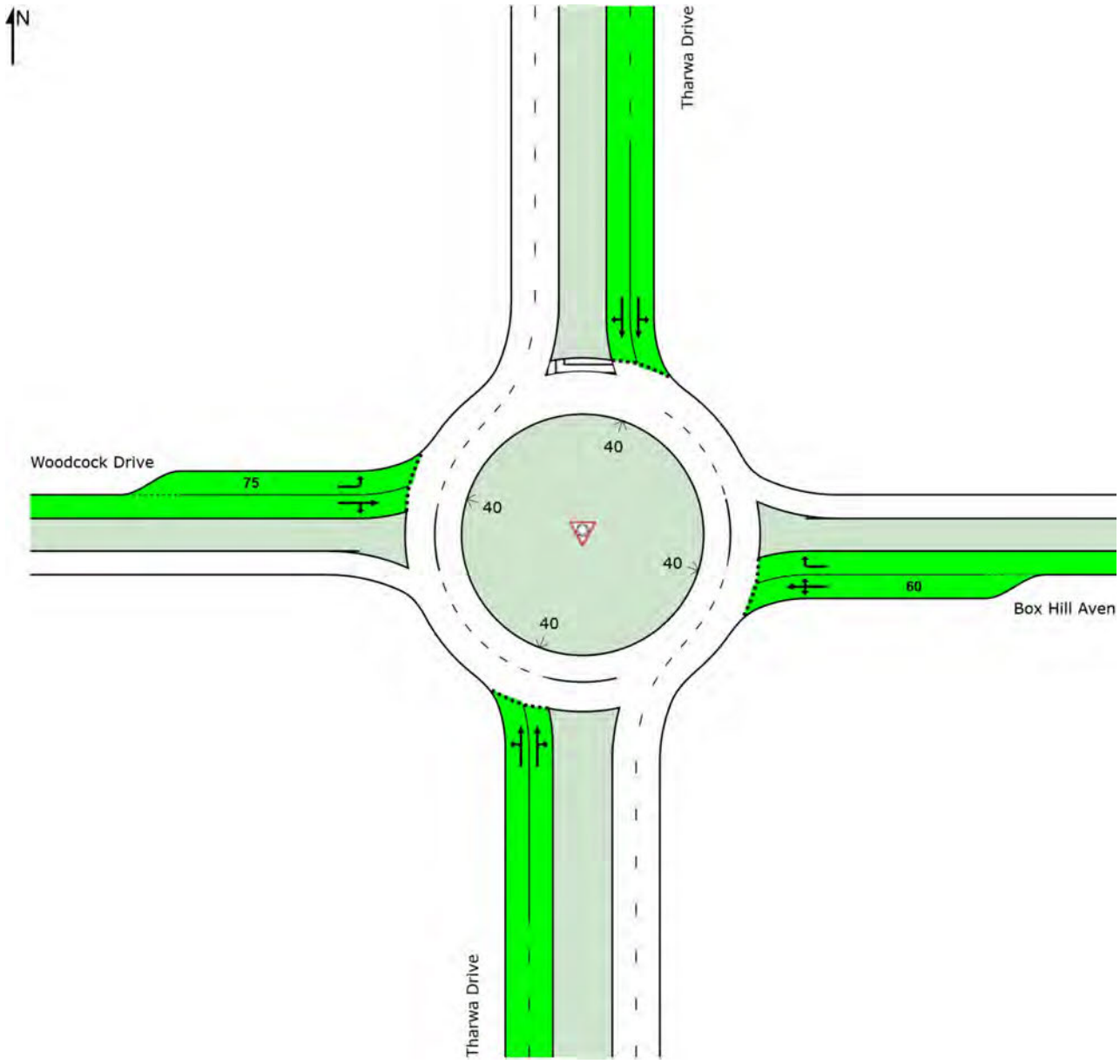
	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	Aver. Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tharwa Drive															
Lane 1[d]	582	2.3	582	2.3	965	0.603	100	6.9	LOS A	1.5	10.9	Full	165	0.0	0.0
Lane 2	460	2.3	460	2.3	762	0.603	100	8.0	LOS A	1.4	10.0	Full	165	0.0	0.0
Approach	1042	2.3	1042	2.3		0.603		7.4	LOS A	1.5	10.9				
East: Box Hill Avenue															
Lane 1[d]	474	2.3	474	2.3	1167	0.406	100	9.6	LOS A	0.9	6.4	Short	60	0.0	NA
Lane 2	401	2.3	401	2.3	987	0.406	100	11.5	LOS A	0.9	6.1	Full	150	0.0	0.0
Approach	875	2.3	875	2.3		0.406		10.4	LOS A	0.9	6.4				
North: Tharwa Drive															
Lane 1[d]	436	2.3	436	2.3	1562	0.279	100	3.6	LOS A	0.8	5.8	Full	490	0.0	0.0
Lane 2	353	2.3	353	2.3	1265	0.279	100	4.8	LOS A	0.8	5.5	Full	490	0.0	0.0
Approach	788	2.3	788	2.3		0.279		4.2	LOS A	0.8	5.8				
West: Woodcock Drive															
Lane 1	125	2.3	125	2.3	572	0.219	100	8.4	LOS A	0.4	3.0	Short	75	0.0	NA
Lane 2[d]	194	2.3	194	2.3	830	0.233	100	8.4	LOS A	0.5	3.7	Full	380	0.0	0.0
Approach	319	2.3	319	2.3		0.233		8.4	LOS A	0.5	3.7				
Intersection	3024	2.3	3024	2.3		0.603		7.5	LOS A	1.5	10.9				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

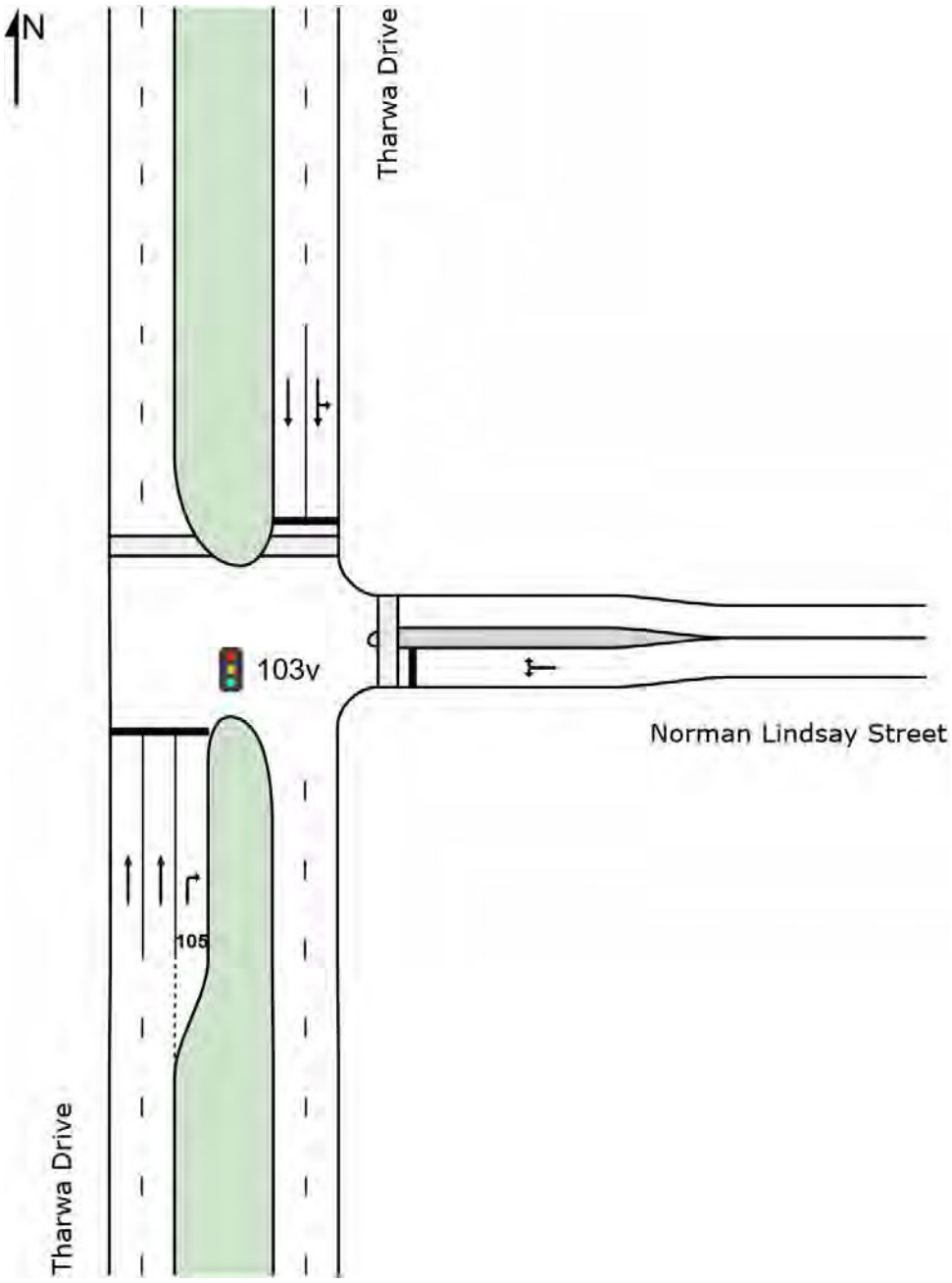
Site: 103v [2041_AM Peak_Tharwa Drive / Norman Lindsay Street - Signals]

Network: 4 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

Signalised T-Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Isolated Cycle Time = 40 seconds (Site Practical Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	889	2.3	889	2.3	0.463	7.2	LOS A	3.6	25.4	0.69	0.60	0.69	50.7
3	R2	151	2.3	151	2.3	0.549	24.2	LOS B	1.8	13.1	0.97	0.80	1.02	36.6
Approach		1040	2.3	1040	2.3	0.549	9.7	LOS A	3.6	25.4	0.73	0.63	0.74	47.9
East: Norman Lindsay Street														
4	L2	79	2.3	79	2.3	0.609	20.7	LOS B	2.7	19.6	0.96	0.83	1.03	8.1
6	R2	152	2.3	152	2.3	0.609	20.7	LOS B	2.7	19.6	0.96	0.83	1.03	8.1
Approach		231	2.3	231	2.3	0.609	20.7	LOS B	2.7	19.6	0.96	0.83	1.03	8.1
North: Tharwa Drive														
7	L2	143	2.3	143	2.3	0.560	22.4	LOS B	2.4	17.3	0.95	0.80	0.97	10.6
8	T1	280	2.3	280	2.3	0.560	16.8	LOS B	2.5	17.9	0.95	0.78	0.97	22.5
Approach		423	2.3	423	2.3	0.560	18.7	LOS B	2.5	17.9	0.95	0.79	0.97	15.7
All Vehicles		1694	2.3	1694	2.3	0.609	13.4	LOS A	3.6	25.4	0.82	0.70	0.84	37.0

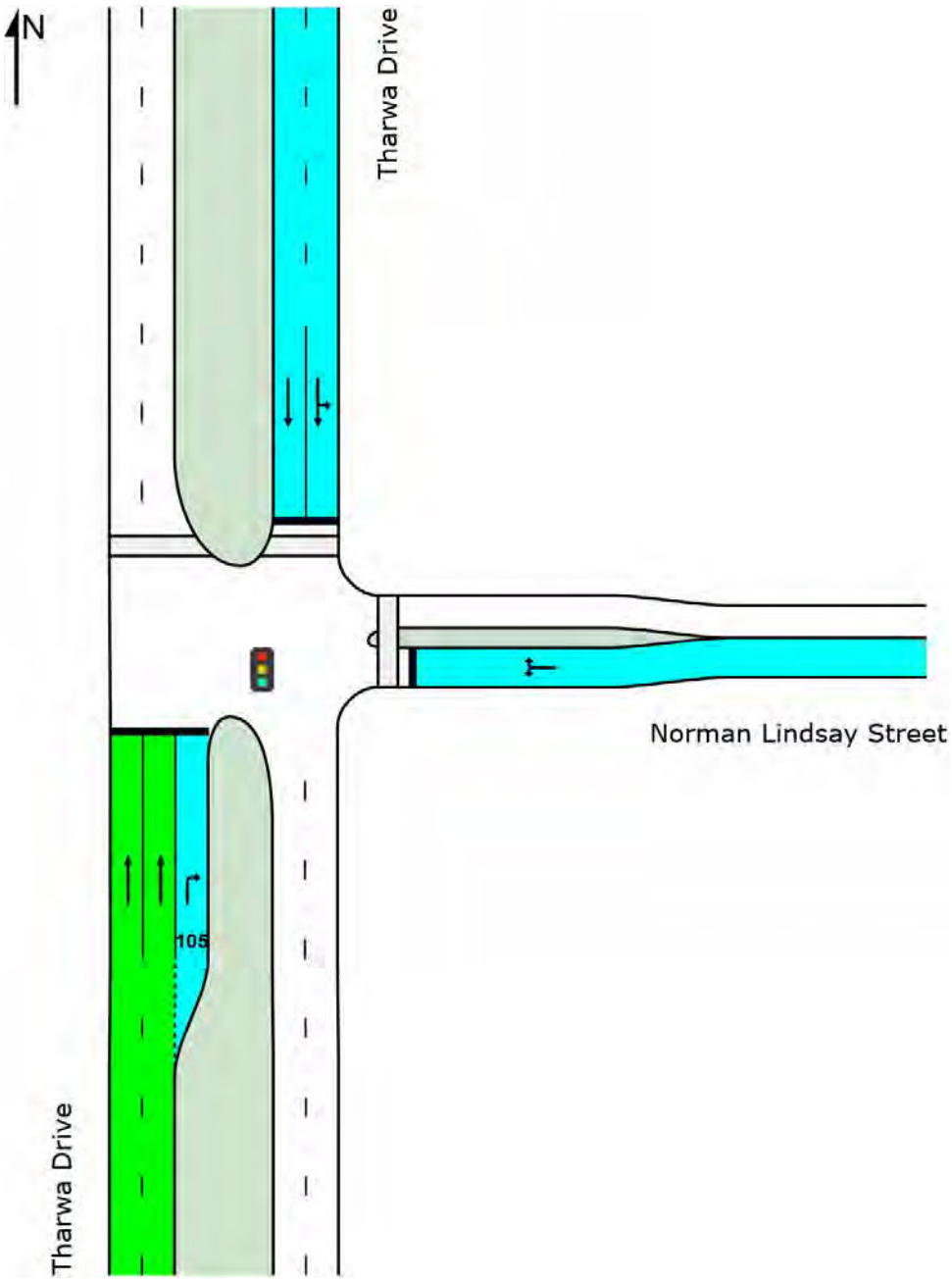
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	445	2.3	445	2.3	961	0.463	100	7.2	LOS A	3.6	25.4	Full	640	0.0	0.0
Lane 2	445	2.3	445	2.3	961	0.463	100	7.2	LOS A	3.6	25.4	Full	640	0.0	0.0
Lane 3	151	2.3	151	2.3	274	0.549	100	24.2	LOS B	1.8	13.1	Short	105	0.0	NA
Approach	1040	2.3	1040	2.3		0.549		9.7	LOS A	3.6	25.4				
East: Norman Lindsay Street															
Lane 1	231	2.3	231	2.3	379	0.609	100	20.7	LOS B	2.7	19.6	Full	40	0.0	0.0
Approach	231	2.3	231	2.3		0.609		20.7	LOS B	2.7	19.6				
North: Tharwa Drive															
Lane 1	208	2.3	208	2.3	371	0.560	100	20.6	LOS B	2.4	17.3	Full	165	0.0	0.0
Lane 2	215	2.3	215	2.3	384	0.560	100	16.8	LOS B	2.5	17.9	Full	165	0.0	0.0
Approach	423	2.3	423	2.3		0.560		18.7	LOS B	2.5	17.9				
Intersection	1694	2.3	1694	2.3		0.609		13.4	LOS A	3.6	25.4				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	B	B	A



Colour code based on Level of Service

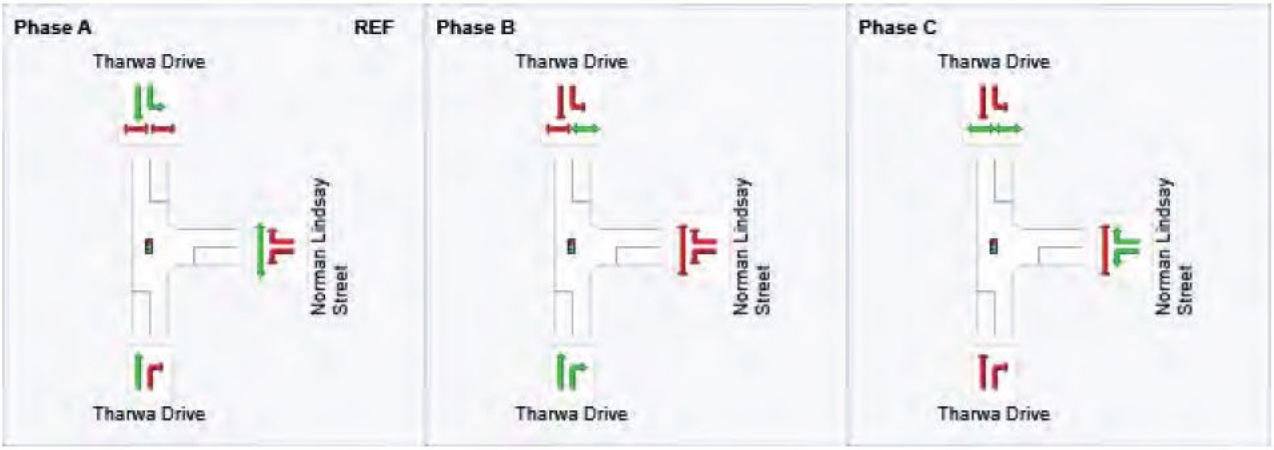
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

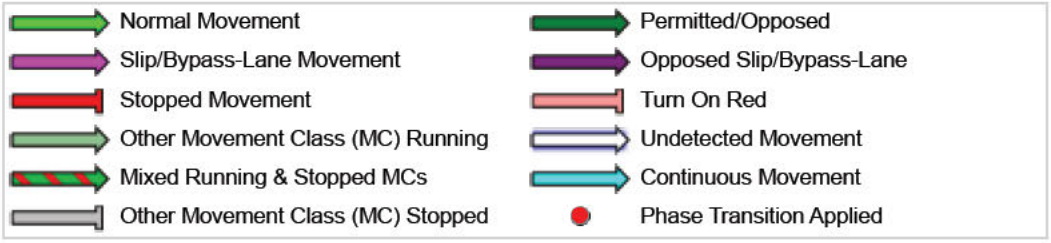
Phase	A	B	C
Phase Change Time (sec)	0	14	26
Green Time (sec)	8	6	8
Phase Time (sec)	14	12	14
Phase Split	35%	30%	35%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

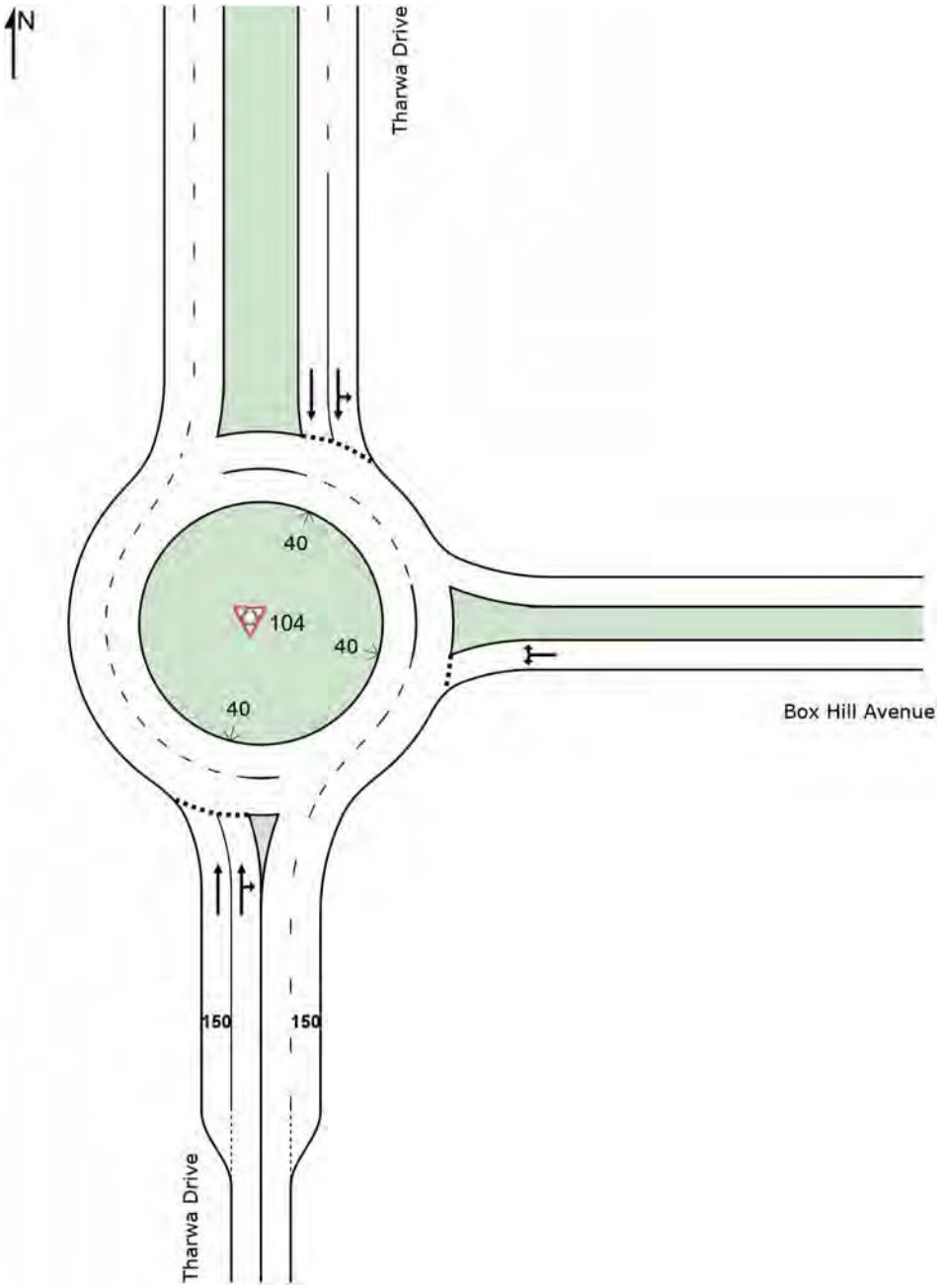


Site: 104 [2041_AM Peak_Tharwa Drive / Box Hill Avenue - Roundabout to single lane]

Network: 4 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

Dual Lane Roundabout - Duplicated to north, return to one lane to south
Site Category: AM Peak 2041 Conditions - Upgraded Layout
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	491	2.3	491	2.3	0.268	5.2	LOS A	0.7	4.7	0.62	0.56	0.62	53.6
3	R2	48	2.3	48	2.3	0.268	12.1	LOS A	0.6	4.4	0.62	0.62	0.62	52.5
Approach		539	2.3	539	2.3	0.268	5.8	LOS A	0.7	4.7	0.62	0.56	0.62	53.5
East: Box Hill Avenue														
4	L2	19	2.3	19	2.3	0.449	4.0	LOS A	1.3	9.1	0.40	0.61	0.40	30.6
6	R2	552	2.3	552	2.3	0.449	10.4	LOS A	1.3	9.1	0.40	0.61	0.40	30.6
Approach		571	2.3	571	2.3	0.449	10.2	LOS A	1.3	9.1	0.40	0.61	0.40	30.6
North: Tharwa Drive														
7	L2	186	2.3	186	2.3	0.120	3.3	LOS A	0.2	1.5	0.13	0.39	0.13	55.6
8	T1	161	2.3	161	2.3	0.116	2.9	LOS A	0.2	1.4	0.13	0.29	0.13	55.1
Approach		347	2.3	347	2.3	0.120	3.1	LOS A	0.2	1.5	0.13	0.34	0.13	55.4
All Vehicles		1457	2.3	1457	2.3	0.449	6.9	LOS A	1.3	9.1	0.42	0.53	0.42	49.6

[redacted]

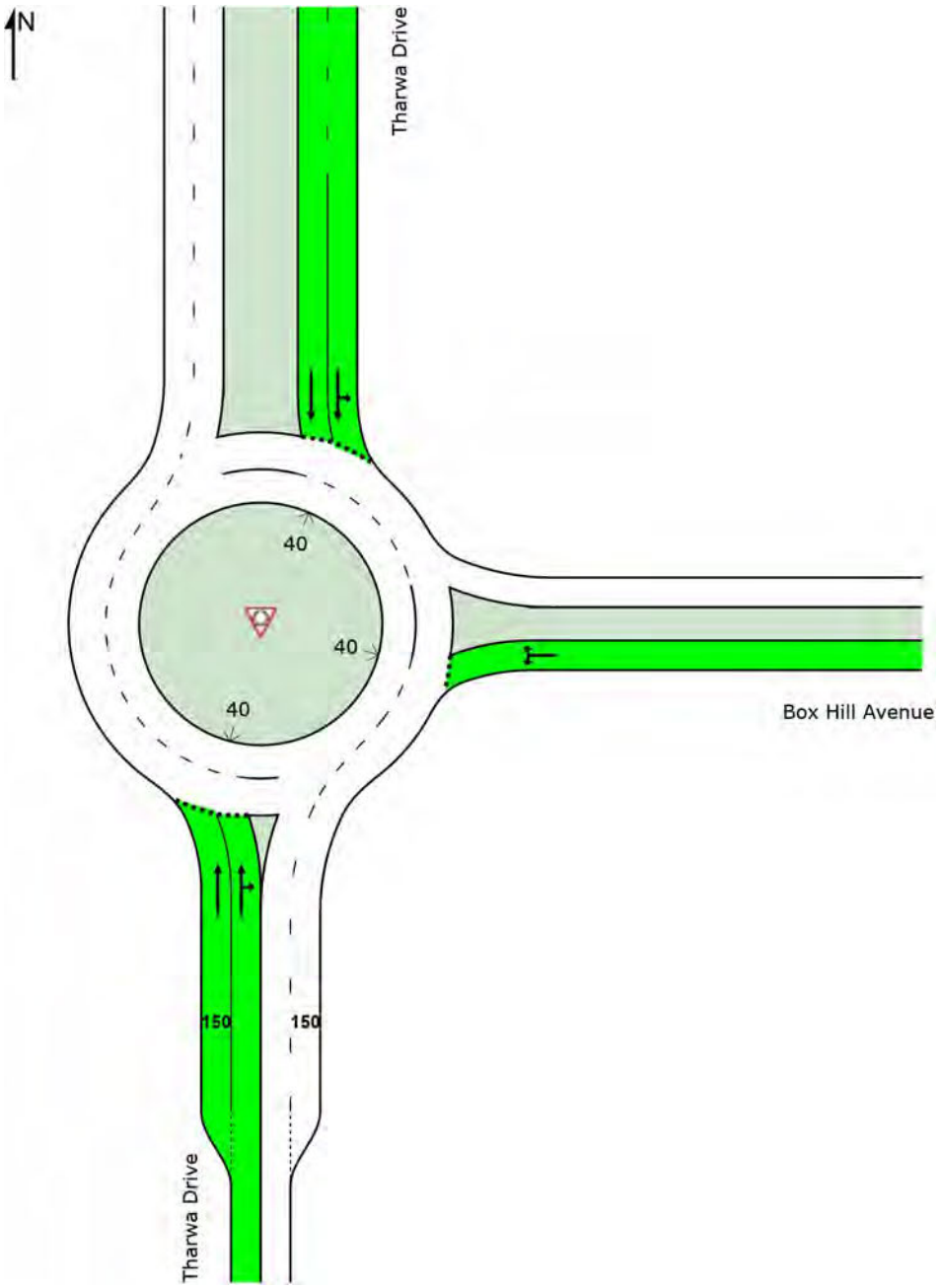
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	291	2.3	291	2.3	1086	0.268	100	5.0	LOS A	0.7	4.7	Short	150	0.0	NA
Lane 2	248	2.3	248	2.3	923	0.268	100	6.8	LOS A	0.6	4.4	Full	990	0.0	0.0
Approach	539	2.3	539	2.3		0.268		5.8	LOS A	0.7	4.7				
East: Box Hill Avenue															
Lane 1[d]	571	2.3	571	2.3	1271	0.449	100	10.2	LOS A	1.3	9.1	Full	105	0.0	0.0
Approach	571	2.3	571	2.3		0.449		10.2	LOS A	1.3	9.1				
North: Tharwa Drive															
Lane 1[d]	186	2.3	186	2.3	1555	0.120	100	3.3	LOS A	0.2	1.5	Full	640	0.0	0.0
Lane 2	161	2.3	161	2.3	1387	0.116	97[5]	2.9	LOS A	0.2	1.4	Full	640	0.0	0.0
Approach	347	2.3	347	2.3		0.120		3.1	LOS A	0.2	1.5				
Intersection	1457	2.3	1457	2.3		0.449		6.9	LOS A	1.3	9.1				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

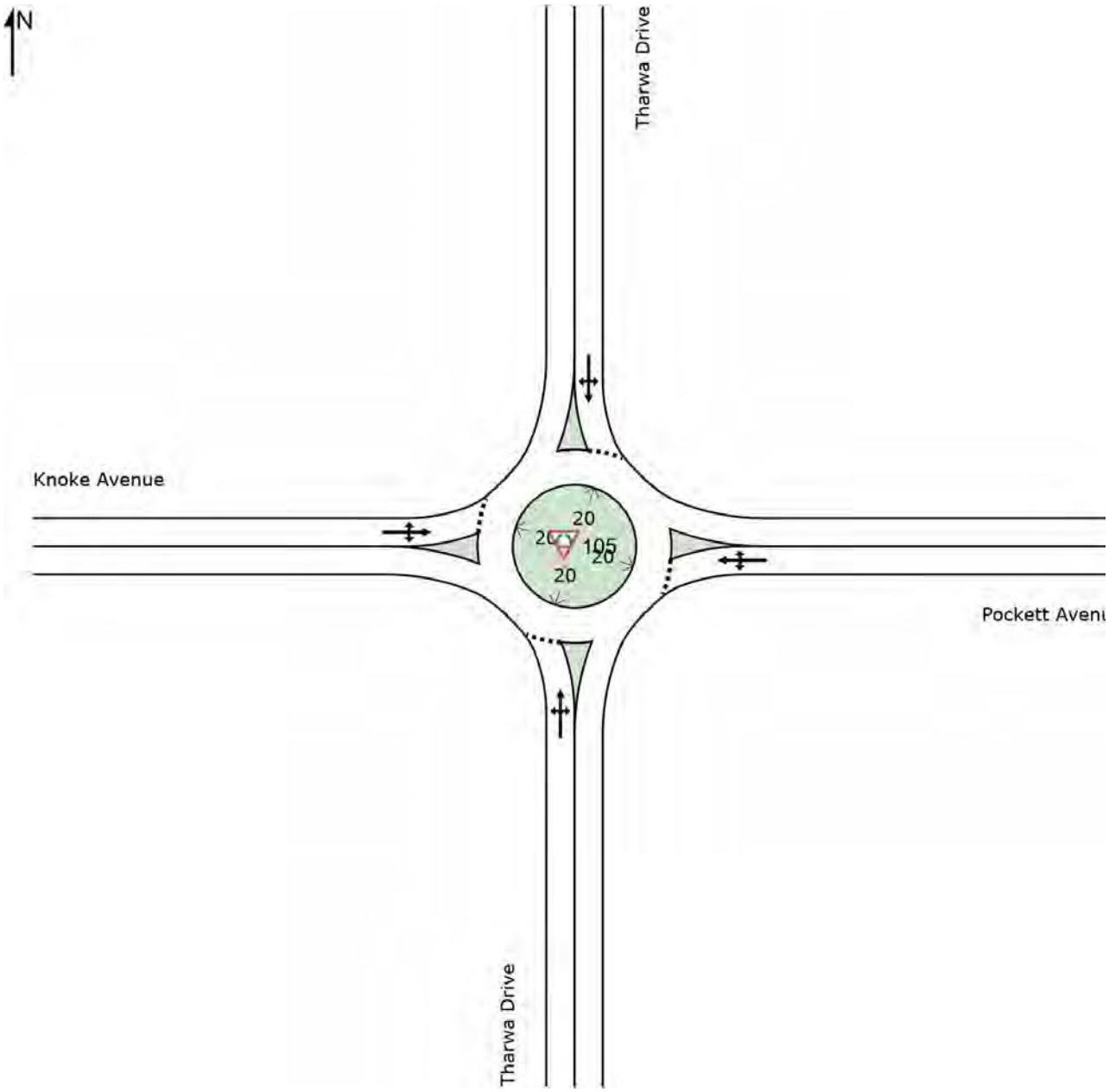
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 105 [2041_AM Peak_Tharwa Drive / Pockett Avenue - Base]

Network: 4 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

Single-Lane Roundabout - Existing Layout
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	1	2.3	1	2.3	0.051	5.6	LOS A	0.1	0.8	0.48	0.53	0.48	49.5
2	T1	51	2.3	51	2.3	0.051	5.8	LOS A	0.1	0.8	0.48	0.53	0.48	49.2
3	R2	1	2.3	1	2.3	0.051	10.5	LOS A	0.1	0.8	0.48	0.53	0.48	47.7
Approach		53	2.3	53	2.3	0.051	5.9	LOS A	0.1	0.8	0.48	0.53	0.48	49.2
East: Pockett Avenue														
4	L2	2	2.3	2	2.3	0.232	3.9	LOS A	0.5	3.8	0.28	0.61	0.28	47.5
5	T1	27	2.3	27	2.3	0.232	4.2	LOS A	0.5	3.8	0.28	0.61	0.28	12.8
6	R2	281	2.3	281	2.3	0.232	8.8	LOS A	0.5	3.8	0.28	0.61	0.28	27.9
Approach		311	2.3	311	2.3	0.232	8.4	LOS A	0.5	3.8	0.28	0.61	0.28	24.2
North: Tharwa Drive														
7	L2	74	2.3	74	2.3	0.117	4.0	LOS A	0.3	1.9	0.15	0.51	0.15	45.6
8	T1	36	2.3	36	2.3	0.117	4.3	LOS A	0.3	1.9	0.15	0.51	0.15	56.6
9	R2	59	2.3	59	2.3	0.117	8.9	LOS A	0.3	1.9	0.15	0.51	0.15	45.4
Approach		168	2.3	168	2.3	0.117	5.8	LOS A	0.3	1.9	0.15	0.51	0.15	48.0
West: Knoke Avenue														
10	L2	199	2.3	199	2.3	0.221	5.7	LOS A	0.5	3.6	0.52	0.61	0.52	31.2
11	T1	31	2.3	31	2.3	0.221	5.9	LOS A	0.5	3.6	0.52	0.61	0.52	23.6
12	R2	3	2.3	3	2.3	0.221	10.6	LOS A	0.5	3.6	0.52	0.61	0.52	52.0
Approach		233	2.3	233	2.3	0.221	5.8	LOS A	0.5	3.6	0.52	0.61	0.52	30.1
All Vehicles		764	2.3	764	2.3	0.232	6.9	LOS A	0.5	3.8	0.34	0.58	0.34	40.0

[redacted]

Lane Use and Performance

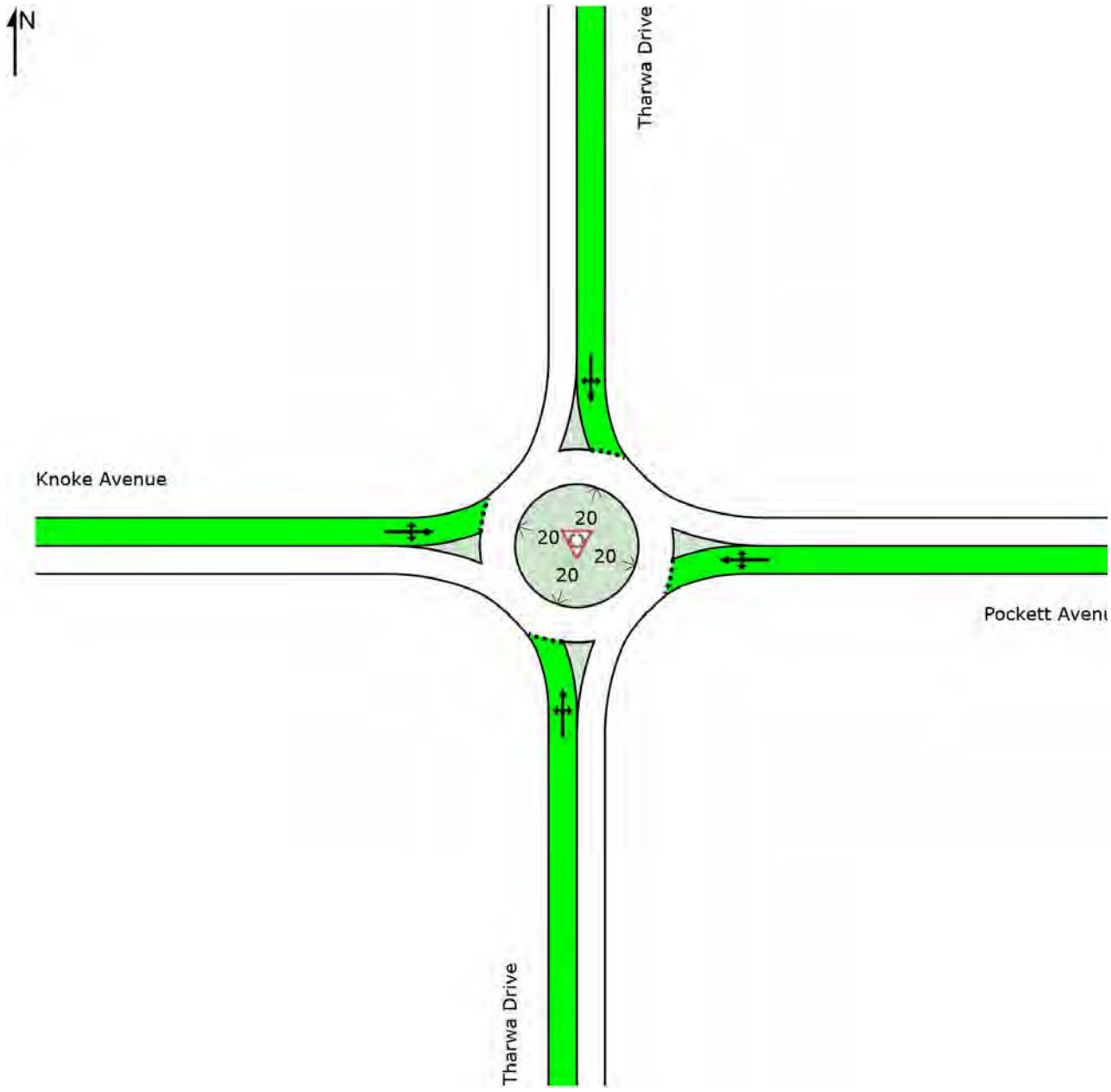
	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	Aver. Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tharwa Drive															
Lane 1[d]	53	2.3	53	2.3	1024	0.051	100	5.9	LOS A	0.1	0.8	Full	500	0.0	0.0
Approach	53	2.3	53	2.3		0.051		5.9	LOS A	0.1	0.8				
East: Pockett Avenue															
Lane 1[d]	311	2.3	311	2.3	1338	0.232	100	8.4	LOS A	0.5	3.8	Full	80	0.0	0.0
Approach	311	2.3	311	2.3		0.232		8.4	LOS A	0.5	3.8				
North: Tharwa Drive															
Lane 1[d]	168	2.3	168	2.3	1440	0.117	100	5.8	LOS A	0.3	1.9	Full	990	0.0	0.0
Approach	168	2.3	168	2.3		0.117		5.8	LOS A	0.3	1.9				
West: Knoke Avenue															
Lane 1[d]	233	2.3	233	2.3	1051	0.221	100	5.8	LOS A	0.5	3.6	Full	95	0.0	0.0
Approach	233	2.3	233	2.3		0.221		5.8	LOS A	0.5	3.6				
Intersection	764	2.3	764	2.3		0.232		6.9	LOS A	0.5	3.8				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

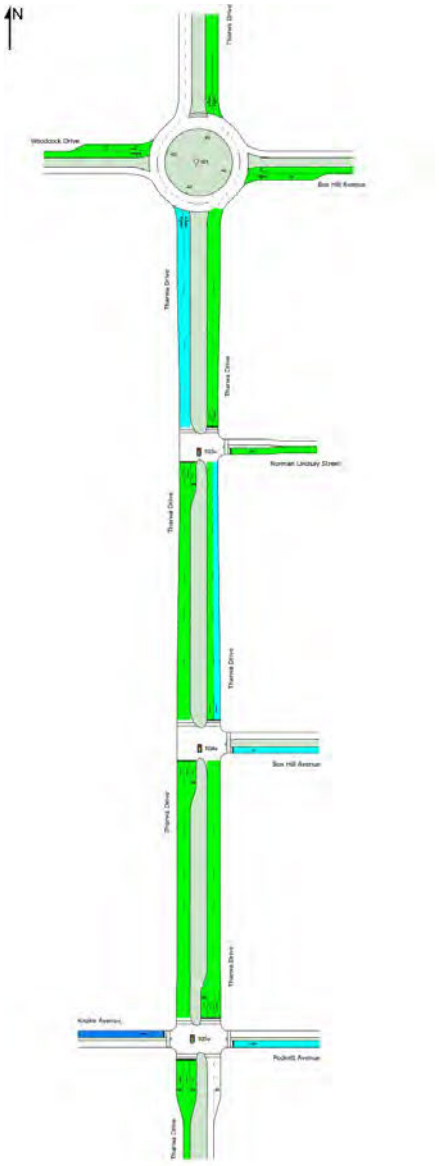
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

2041 Future Conditions - Upgraded Layout Option 2
Network Category: (None)
Network Cycle Time = 60 seconds (Network User-Given Cycle Time)



Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op1]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

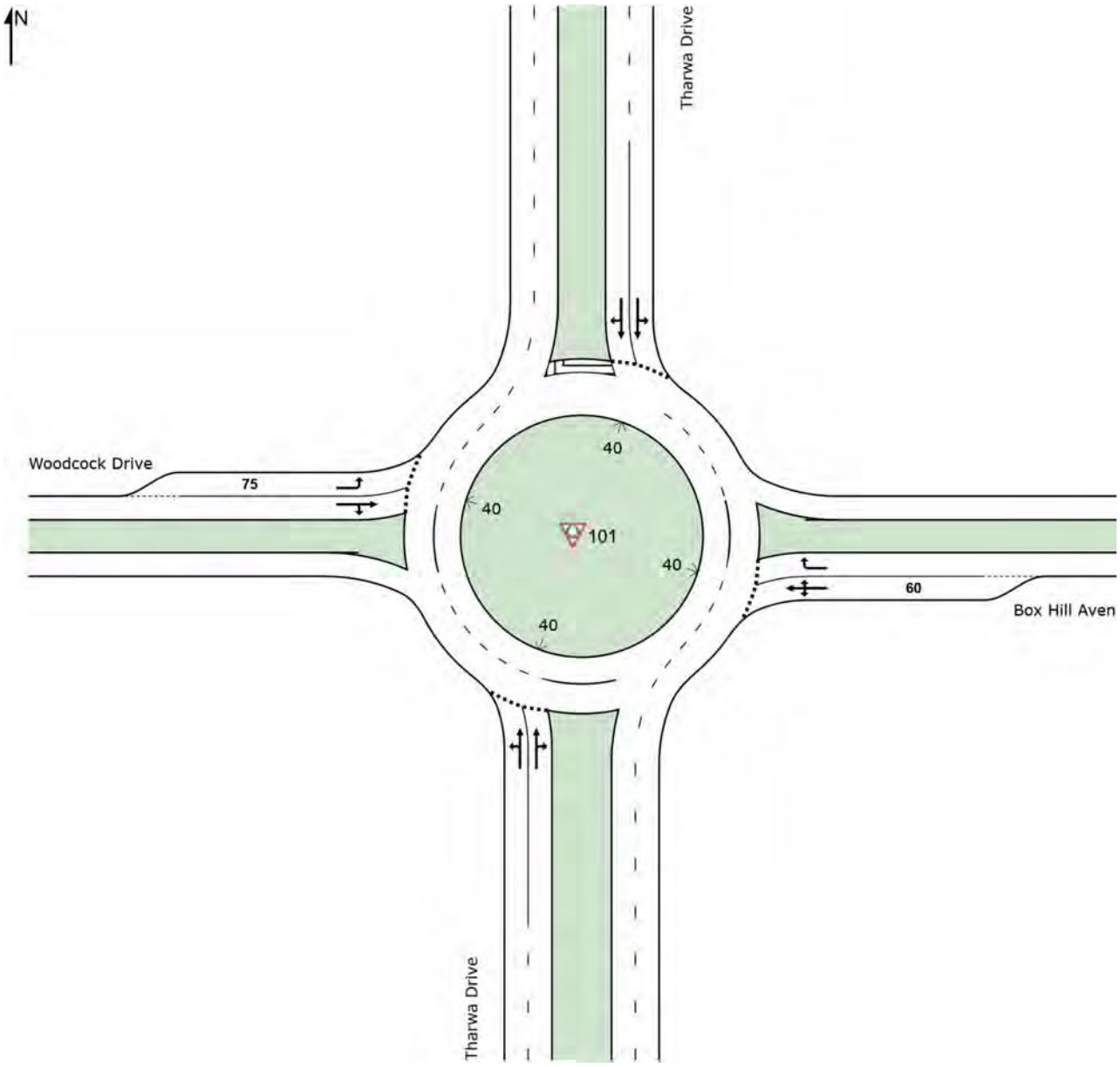
Template: Default Site User Report (2)

Site: 101 [2041_AM Peak_Tharwa Drive / Woodcock Drive - Duplicated]

Network: 6 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

Two Lane Roundabout - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	77	2.3	77	2.3	0.603	7.2	LOS A	1.5	10.8	0.69	0.75	0.83	49.3
2	T1	963	2.3	963	2.3	0.603	7.4	LOS A	1.5	10.8	0.71	0.80	0.86	53.4
3	R2	2	2.3	2	2.3	0.603	14.4	LOS A	1.4	9.9	0.72	0.85	0.89	42.0
Approach		1042	2.3	1042	2.3	0.603	7.4	LOS A	1.5	10.8	0.70	0.80	0.86	53.1
East: Box Hill Avenue														
4	L2	14	2.3	14	2.3	0.406	4.8	LOS A	0.9	6.4	0.56	0.70	0.56	34.0
5	T1	99	2.3	99	2.3	0.406	4.7	LOS A	0.9	6.4	0.56	0.70	0.56	49.3
6	R2	762	2.3	762	2.3	0.406	11.3	LOS A	0.9	6.4	0.57	0.74	0.57	50.7
Approach		875	2.3	875	2.3	0.406	10.4	LOS A	0.9	6.4	0.57	0.73	0.57	50.4
North: Tharwa Drive														
7	L2	369	2.3	369	2.3	0.279	3.7	LOS A	0.8	5.8	0.44	0.45	0.44	53.3
8	T1	351	2.3	351	2.3	0.279	3.4	LOS A	0.8	5.8	0.46	0.44	0.46	50.2
9	R2	68	2.3	68	2.3	0.279	10.4	LOS A	0.8	5.5	0.46	0.43	0.46	56.9
Approach		788	2.3	788	2.3	0.279	4.2	LOS A	0.8	5.8	0.45	0.44	0.45	52.5
West: Woodcock Drive														
10	L2	125	2.3	125	2.3	0.218	8.4	LOS A	0.4	3.0	0.77	0.86	0.77	52.1
11	T1	136	2.3	136	2.3	0.233	6.3	LOS A	0.5	3.8	0.79	0.75	0.79	50.4
12	R2	58	2.3	58	2.3	0.233	13.3	LOS A	0.5	3.8	0.79	0.75	0.79	44.2
Approach		319	2.3	319	2.3	0.233	8.4	LOS A	0.5	3.8	0.78	0.79	0.78	50.4
All Vehicles		3024	2.3	3024	2.3	0.603	7.5	LOS A	1.5	10.8	0.61	0.69	0.66	51.8

[redacted]

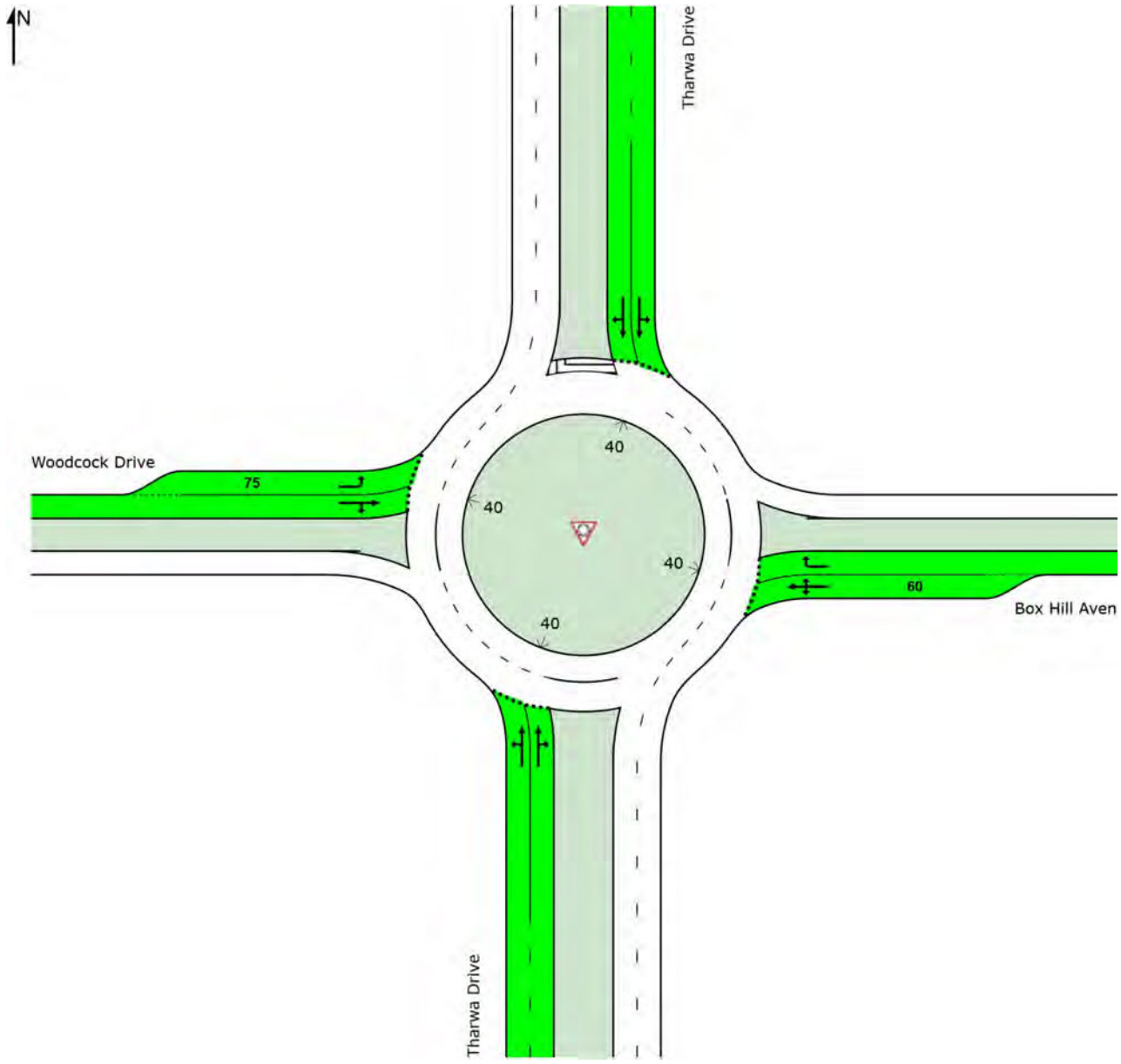
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	582	2.3	582	2.3	965	0.603	100	6.9	LOS A	1.5	10.8	Full	165	0.0	0.0
Lane 2	460	2.3	460	2.3	762	0.603	100	8.0	LOS A	1.4	9.9	Full	165	0.0	0.0
Approach	1042	2.3	1042	2.3		0.603		7.4	LOS A	1.5	10.8				
East: Box Hill Avenue															
Lane 1[d]	474	2.3	474	2.3	1167	0.406	100	9.6	LOS A	0.9	6.4	Short	60	0.0	NA
Lane 2	401	2.3	401	2.3	987	0.406	100	11.5	LOS A	0.9	6.1	Full	150	0.0	0.0
Approach	875	2.3	875	2.3		0.406		10.4	LOS A	0.9	6.4				
North: Tharwa Drive															
Lane 1[d]	436	2.3	436	2.3	1562	0.279	100	3.6	LOS A	0.8	5.8	Full	490	0.0	0.0
Lane 2	353	2.3	353	2.3	1265	0.279	100	4.8	LOS A	0.8	5.5	Full	490	0.0	0.0
Approach	788	2.3	788	2.3		0.279		4.2	LOS A	0.8	5.8				
West: Woodcock Drive															
Lane 1	125	2.3	125	2.3	575	0.218	100	8.4	LOS A	0.4	3.0	Short	75	0.0	NA
Lane 2[d]	194	2.3	194	2.3	832	0.233	100	8.4	LOS A	0.5	3.8	Full	380	0.0	0.0
Approach	319	2.3	319	2.3		0.233		8.4	LOS A	0.5	3.8				
Intersection	3024	2.3	3024	2.3		0.603		7.5	LOS A	1.5	10.8				

[redacted]

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

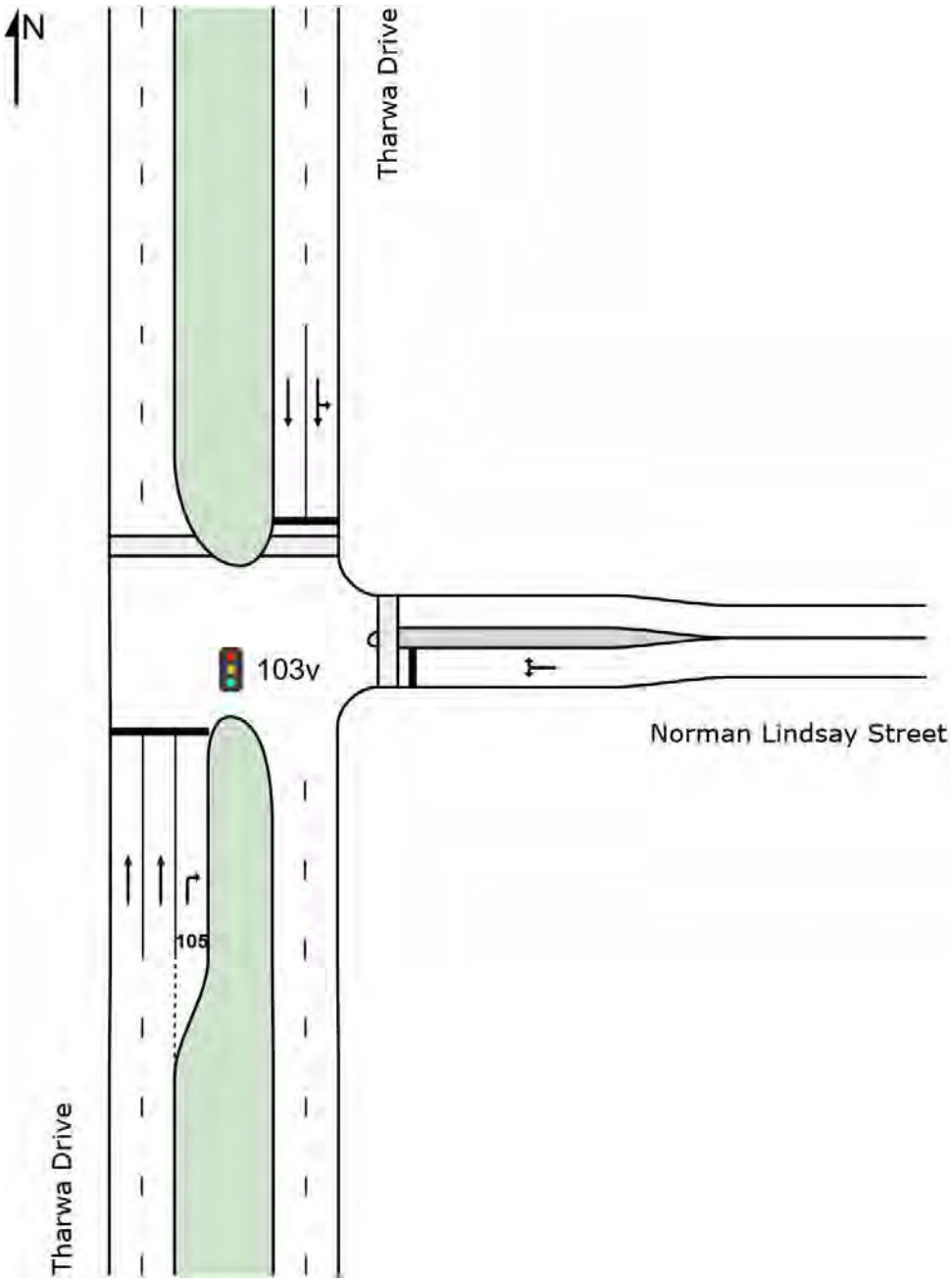
Site: 103v [2041_AM Peak_Tharwa Drive / Norman Lindsay Street - Signals]

Network: 6 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

Signalised T-Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 60 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	889	2.3	889	2.3	0.434	11.5	LOS A	6.0	43.1	0.80	0.70	0.80	46.4
3	R2	151	2.3	151	2.3	0.449	30.2	LOS C	2.4	17.2	0.89	0.78	0.89	33.7
Approach		1040	2.3	1040	2.3	0.449	14.2	LOS A	6.0	43.1	0.81	0.71	0.81	43.9
East: Norman Lindsay Street														
4	L2	79	2.3	79	2.3	0.457	23.9	LOS B	3.6	25.5	0.88	0.79	0.88	7.2
6	R2	152	2.3	152	2.3	0.457	23.8	LOS B	3.6	25.5	0.88	0.79	0.88	7.2
Approach		231	2.3	231	2.3	0.457	23.9	LOS B	3.6	25.5	0.88	0.79	0.88	7.2
North: Tharwa Drive														
7	L2	143	2.3	143	2.3	0.448	26.8	LOS B	3.3	23.3	0.89	0.78	0.89	10.0
8	T1	280	2.3	280	2.3	0.448	21.2	LOS B	3.4	24.1	0.89	0.74	0.89	19.5
Approach		423	2.3	423	2.3	0.448	23.1	LOS B	3.4	24.1	0.89	0.75	0.89	14.2
All Vehicles		1694	2.3	1694	2.3	0.457	17.7	LOS B	6.0	43.1	0.84	0.73	0.84	33.8

[redacted]

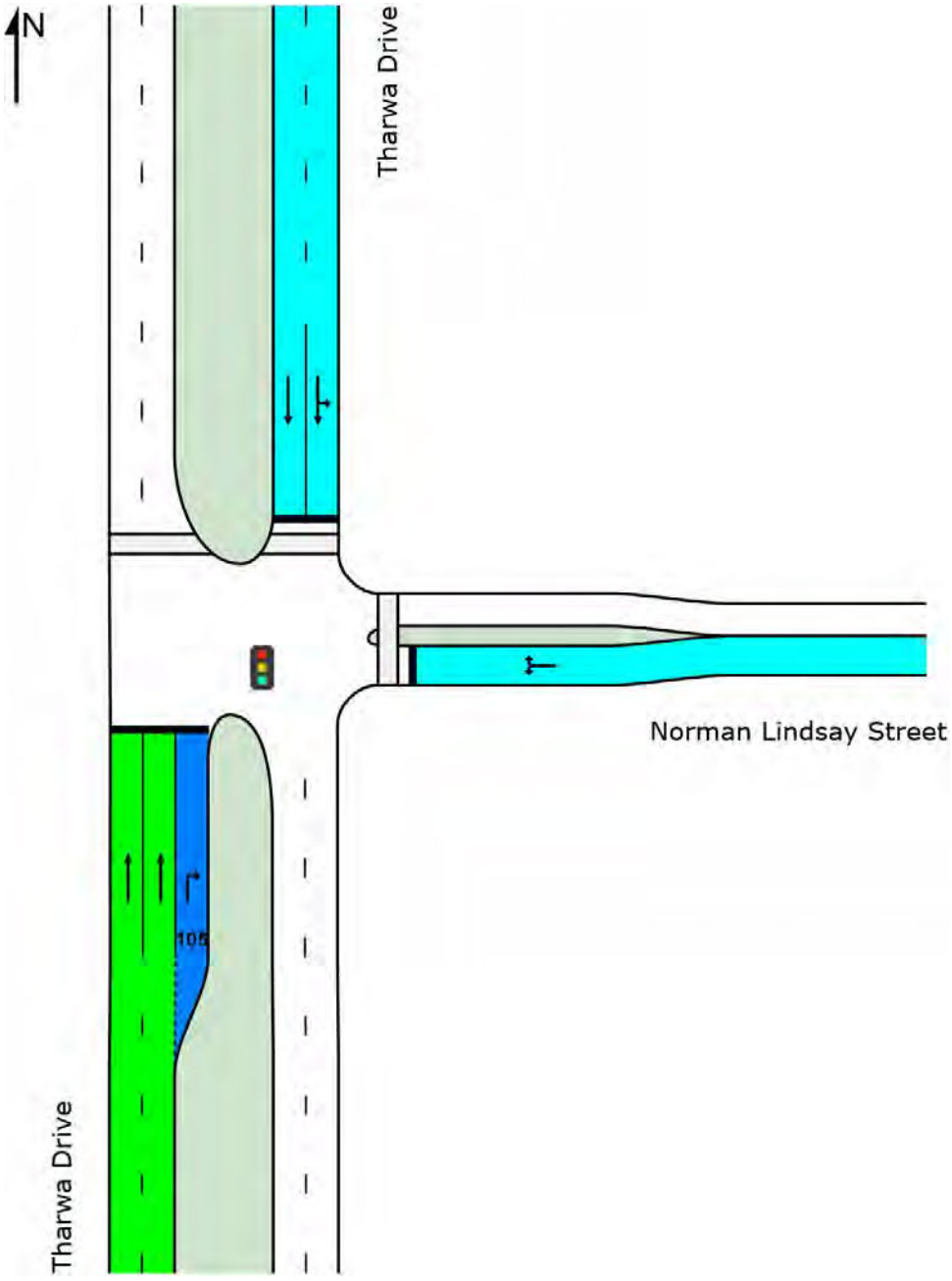
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	445	2.3	445	2.3	1025	0.434	100	11.6	LOS A	6.0	43.1	Full	640	0.0	0.0
Lane 2	445	2.3	445	2.3	1025	0.434	100	11.3	LOS A	5.9	42.4	Full	640	0.0	0.0
Lane 3	151	2.3	151	2.3	335	0.449	100	30.2	LOS C	2.4	17.2	Short	105	0.0	NA
Approach	1040	2.3	1040	2.3		0.449		14.2	LOS A	6.0	43.1				
East: Norman Lindsay Street															
Lane 1	231	2.3	231	2.3	505	0.457	100	23.9	LOS B	3.6	25.5	Full	40	0.0	8.4
Approach	231	2.3	231	2.3		0.457		23.9	LOS B	3.6	25.5				
North: Tharwa Drive															
Lane 1	208	2.3	208	2.3	464	0.448	100	25.0	LOS B	3.3	23.3	Full	165	0.0	0.0
Lane 2	215	2.3	215	2.3	480	0.448	100	21.2	LOS B	3.4	24.1	Full	165	0.0	0.0
Approach	423	2.3	423	2.3		0.448		23.1	LOS B	3.4	24.1				
Intersection	1694	2.3	1694	2.3		0.457		17.7	LOS B	6.0	43.1				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	B	B	B



Colour code based on Level of Service

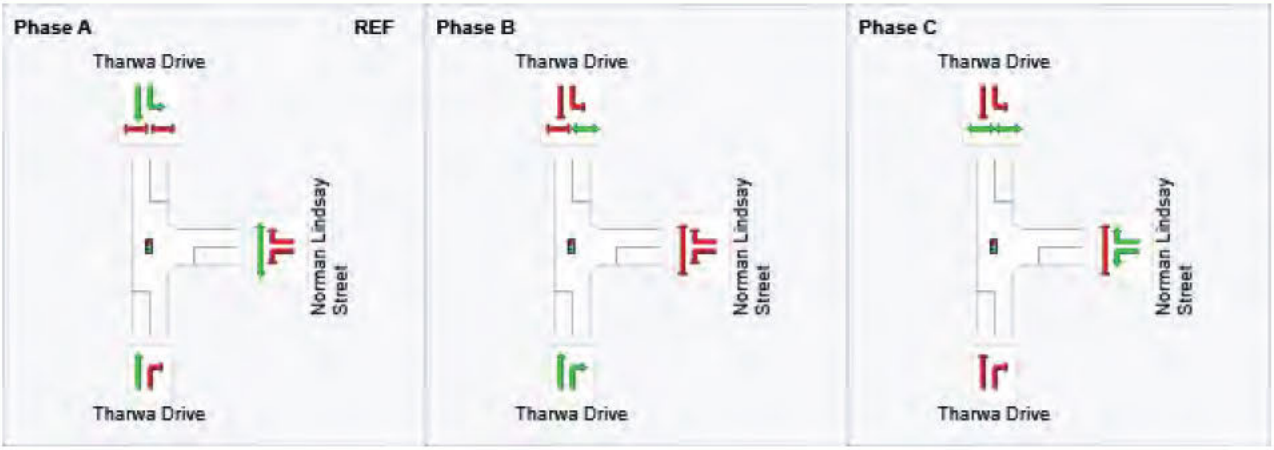
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

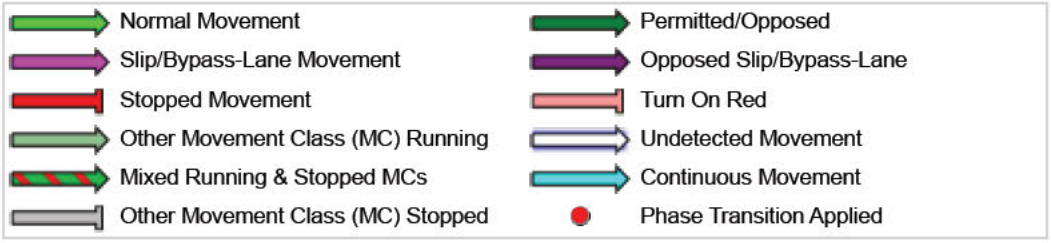
Phase	A	B	C
Phase Change Time (sec)	29	50	7
Green Time (sec)	15	11	16
Phase Time (sec)	21	17	22
Phase Split	35%	28%	37%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



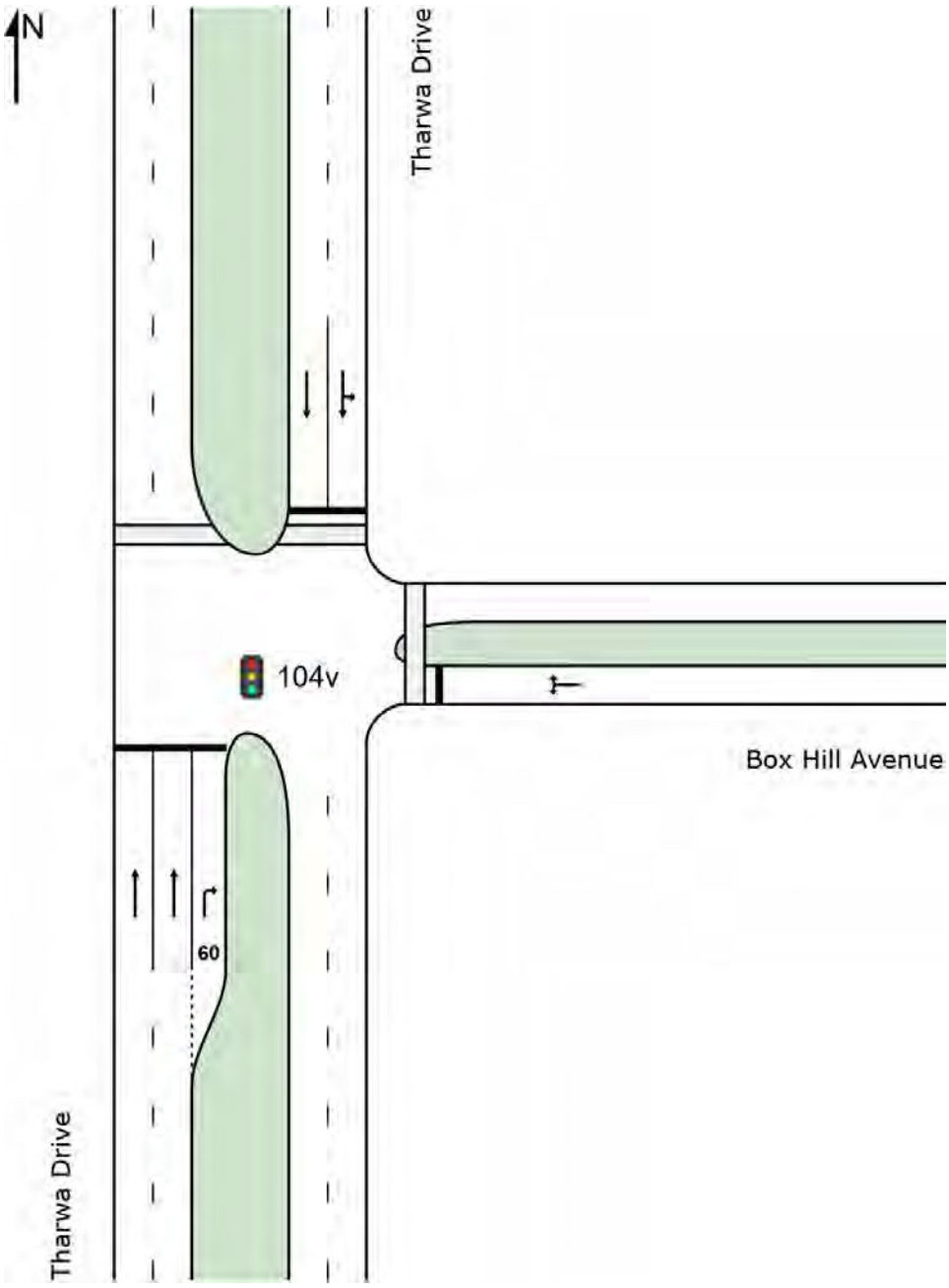
Site: 104v [2041_AM Peak_Tharwa Drive / Box Hill Avenue - Signals]

Network: 6 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

Signalised Cross Intersection
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 60 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	491	2.3	491	2.3	0.352	22.9	LOS B	4.4	31.2	1.00	0.83	1.00	43.4
3	R2	48	2.3	48	2.3	0.262	37.1	LOS C	0.9	6.6	1.00	0.74	1.00	37.9
Approach		539	2.3	539	2.3	0.352	24.2	LOS B	4.4	31.2	1.00	0.82	1.00	42.8
East: Box Hill Avenue														
4	L2	19	2.3	19	2.3	0.670	19.8	LOS B	8.2	58.5	0.84	0.83	0.84	16.1
6	R2	552	2.3	552	2.3	0.670	19.8	LOS B	8.2	58.5	0.84	0.83	0.84	16.1
Approach		571	2.3	571	2.3	0.670	19.8	LOS B	8.2	58.5	0.84	0.83	0.84	16.1
North: Tharwa Drive														
7	L2	186	2.3	186	2.3	0.656	33.6	LOS C	3.3	23.8	0.97	0.83	1.04	33.8
8	T1	161	2.3	161	2.3	0.539	31.0	LOS C	3.0	21.6	1.00	0.80	1.00	33.5
Approach		347	2.3	347	2.3	0.656	32.4	LOS C	3.3	23.8	0.98	0.82	1.02	33.6
All Vehicles		1457	2.3	1457	2.3	0.670	24.4	LOS B	8.2	58.5	0.93	0.83	0.94	35.4

[redacted]

Lane Use and Performance

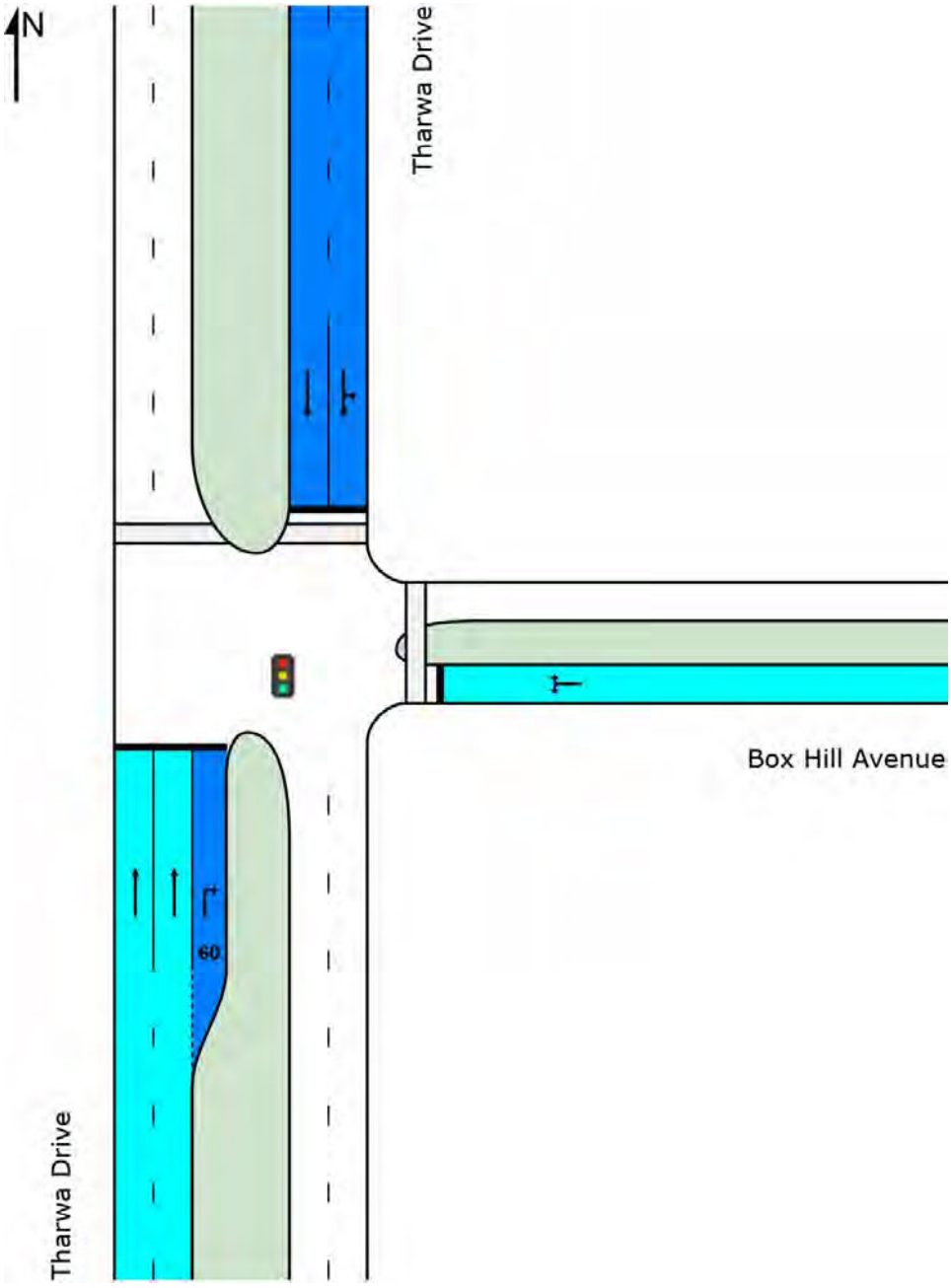
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	245	2.3	245	2.3	697	0.352	100	22.3	LOS B	4.2	30.1	Full	990	0.0	0.0
Lane 2	245	2.3	245	2.3	697	0.352	100	23.5	LOS B	4.4	31.2	Full	990	0.0	0.0
Lane 3	48	2.3	48	2.3	185	0.262	100	37.1	LOS C	0.9	6.6	Short	60	0.0	NA
Approach	539	2.3	539	2.3		0.352		24.2	LOS B	4.4	31.2				
East: Box Hill Avenue															
Lane 1	571	2.3	571	2.3	852	0.670	100	19.8	LOS B	8.2	58.5	Full	105	0.0	0.0
Approach	571	2.3	571	2.3		0.670		19.8	LOS B	8.2	58.5				
North: Tharwa Drive															
Lane 1	186	2.3	186	2.3	284	0.656	100	33.6	LOS C	3.3	23.8	Full	640	0.0	0.0
Lane 2	161	2.3	161	2.3	299	0.539	82[5]	31.0	LOS C	3.0	21.6	Full	640	0.0	0.0
Approach	347	2.3	347	2.3		0.656		32.4	LOS C	3.3	23.8				
Intersection	1457	2.3	1457	2.3		0.670		24.4	LOS B	8.2	58.5				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	B	B	C	B



Colour code based on Level of Service

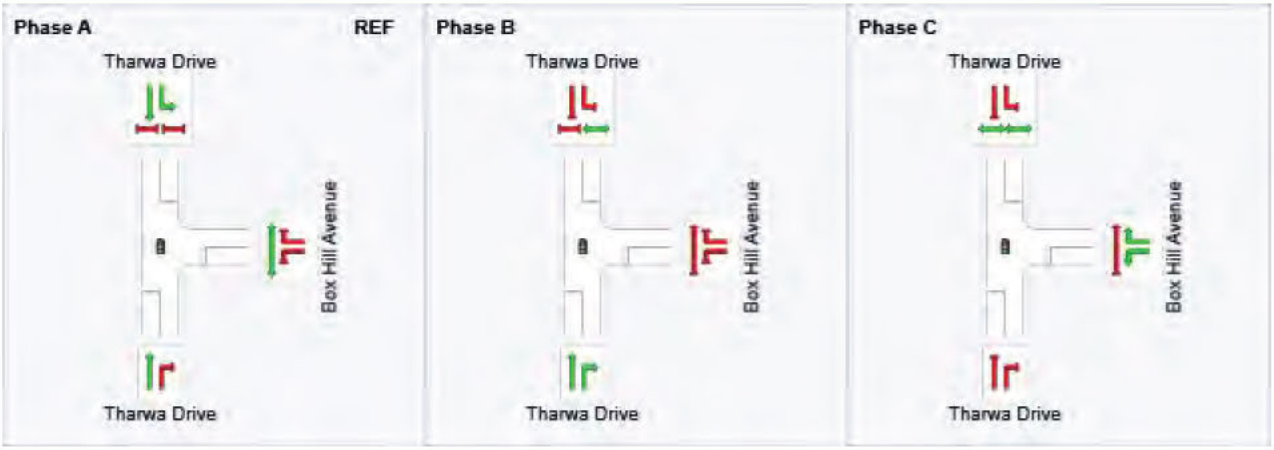
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

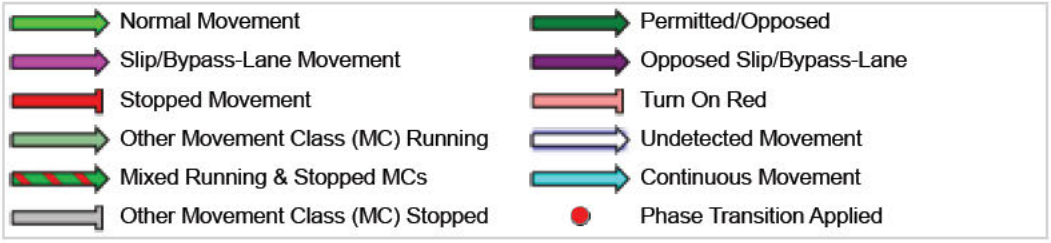
Phase	A	B	C
Phase Change Time (sec)	45	60	12
Green Time (sec)	9	6	27
Phase Time (sec)	15	12	33
Phase Split	25%	20%	55%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



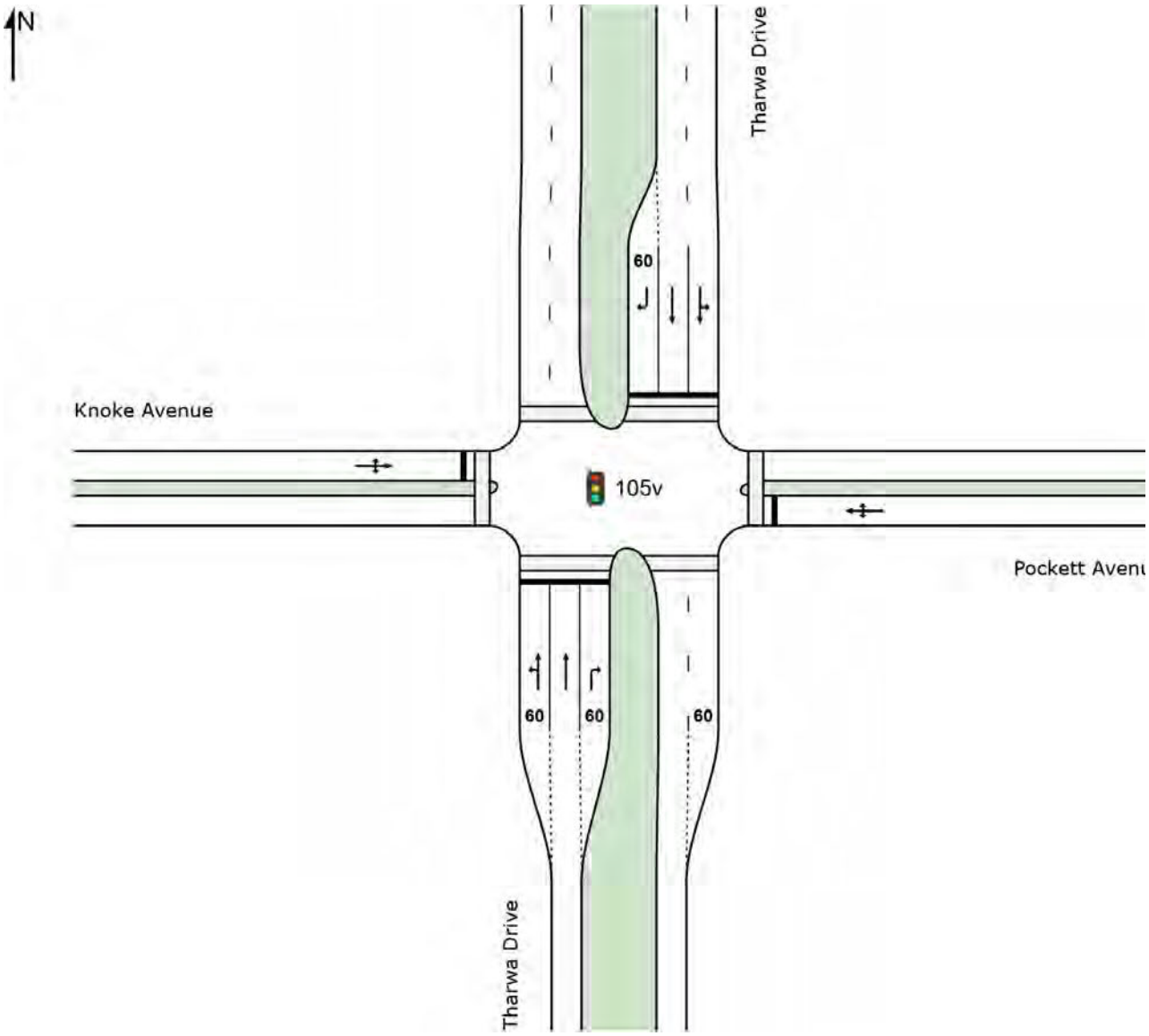
Site: 105v [2041_AM Peak_Tharwa Drive / Pockett Avenue - Signals]

Network: 6 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

Signalised Cross Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 60 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Diamond Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	1	2.3	1	2.3	0.130	33.7	LOS C	0.4	3.2	0.94	0.67	0.94	17.2
2	T1	51	2.3	51	2.3	0.130	28.1	LOS B	0.4	3.2	0.94	0.67	0.94	31.2
3	R2	1	2.3	1	2.3	0.006	32.5	LOS C	0.0	0.1	0.92	0.59	0.92	30.3
Approach		53	2.3	53	2.3	0.130	28.3	LOS B	0.4	3.2	0.94	0.67	0.94	30.6
East: Pockett Avenue														
4	L2	2	2.3	2	2.3	0.700	29.9	LOS C	5.5	39.3	0.97	0.87	1.06	32.1
5	T1	27	2.3	27	2.3	0.700	24.8	LOS B	5.5	39.3	0.97	0.87	1.06	17.1
6	R2	281	2.3	281	2.3	0.700	29.9	LOS C	5.5	39.3	0.97	0.87	1.06	10.2
Approach		311	2.3	311	2.3	0.700	29.5	LOS C	5.5	39.3	0.97	0.87	1.06	11.1
North: Tharwa Drive														
7	L2	74	2.3	74	2.3	0.389	37.6	LOS C	1.4	10.1	1.00	0.76	1.00	37.1
8	T1	36	2.3	36	2.3	0.180	30.9	LOS C	0.7	4.8	1.00	0.72	1.00	44.7
9	R2	59	2.3	59	2.3	0.311	37.2	LOS C	1.1	8.0	1.00	0.75	1.00	37.4
Approach		168	2.3	168	2.3	0.389	36.0	LOS C	1.4	10.1	1.00	0.75	1.00	39.0
West: Knoke Avenue														
10	L2	199	2.3	199	2.3	0.732	34.3	LOS C	4.4	31.4	1.00	0.90	1.17	10.0
11	T1	31	2.3	31	2.3	0.732	28.8	LOS C	4.4	31.4	1.00	0.90	1.17	15.3
12	R2	3	2.3	3	2.3	0.732	34.4	LOS C	4.4	31.4	1.00	0.90	1.17	30.7
Approach		233	2.3	233	2.3	0.732	33.6	LOS C	4.4	31.4	1.00	0.90	1.17	11.2
All Vehicles		764	2.3	764	2.3	0.732	32.1	LOS C	5.5	39.3	0.98	0.84	1.07	24.7

[redacted]

Lane Use and Performance

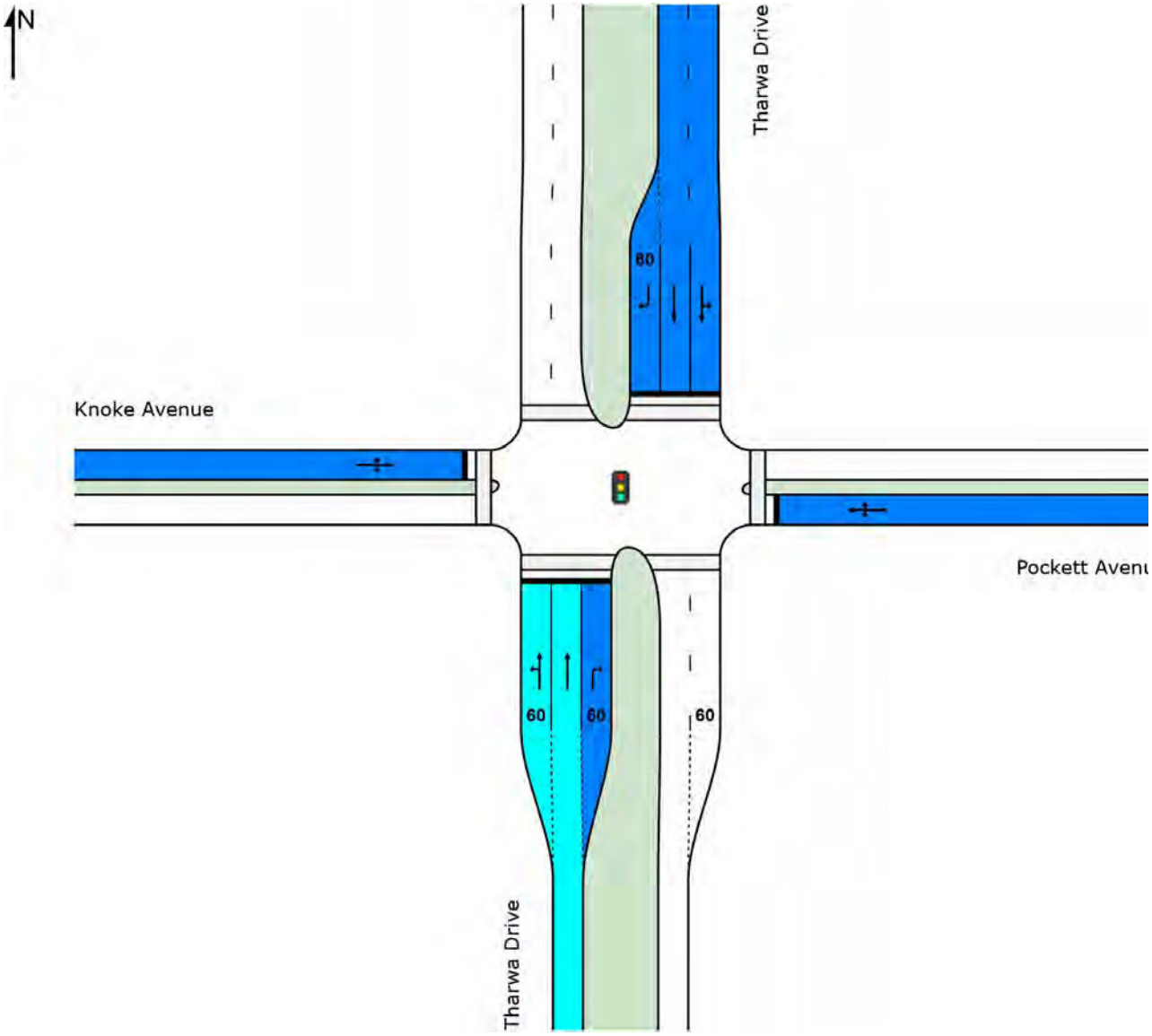
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	26	2.3	26	2.3	199	0.130	100	28.4	LOS B	0.4	3.2	Short	60	0.0	NA
Lane 2	26	2.3	26	2.3	199	0.130	100	28.1	LOS B	0.4	3.2	Full	500	0.0	0.0
Lane 3	1	2.3	1	2.3	189	0.006	100	32.5	LOS C	0.0	0.1	Short	60	0.0	NA
Approach	53	2.3	53	2.3		0.130		28.3	LOS B	0.4	3.2				
East: Pockett Avenue															
Lane 1	311	2.3	311	2.3	444	0.700	100	29.5	LOS C	5.5	39.3	Full	80	0.0	0.0
Approach	311	2.3	311	2.3		0.700		29.5	LOS C	5.5	39.3				
North: Tharwa Drive															
Lane 1	74	2.3	74	2.3	189	0.389	100	37.6	LOS C	1.4	10.1	Full	990	0.0	0.0
Lane 2	36	2.3	36	2.3	199	0.180	46[5]	30.9	LOS C	0.7	4.8	Full	990	0.0	0.0
Lane 3	59	2.3	59	2.3	189	0.311	100	37.2	LOS C	1.1	8.0	Short	60	0.0	NA
Approach	168	2.3	168	2.3		0.389		36.0	LOS C	1.4	10.1				
West: Knoke Avenue															
Lane 1	233	2.3	233	2.3	318	0.732	100	33.6	LOS C	4.4	31.4	Full	95	0.0	0.0
Approach	233	2.3	233	2.3		0.732		33.6	LOS C	4.4	31.4				
Intersection	764	2.3	764	2.3		0.732		32.1	LOS C	5.5	39.3				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

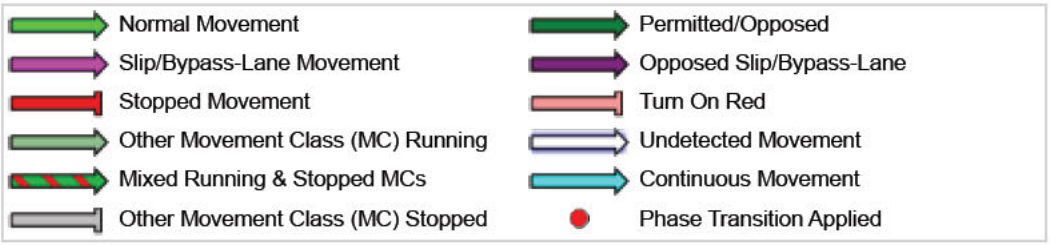
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	12	24	44
Green Time (sec)	6	6	14	10
Phase Time (sec)	12	12	20	16
Phase Split	20%	20%	33%	27%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

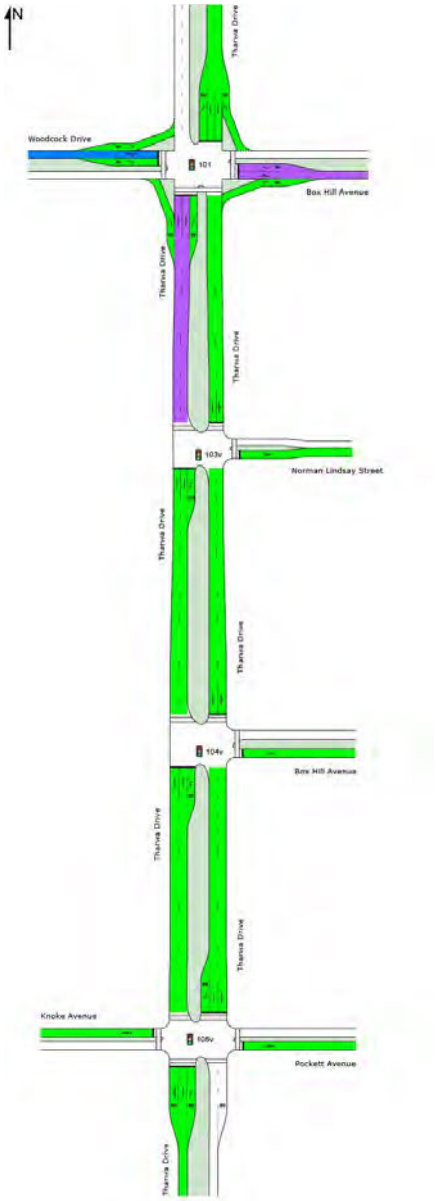


DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

2041 Future Conditions - Upgraded Layout Option 3
Network Category: (None)
Network Cycle Time = 90 seconds (Network User-Given Cycle Time)



Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

Template: Default Site User Report (2)

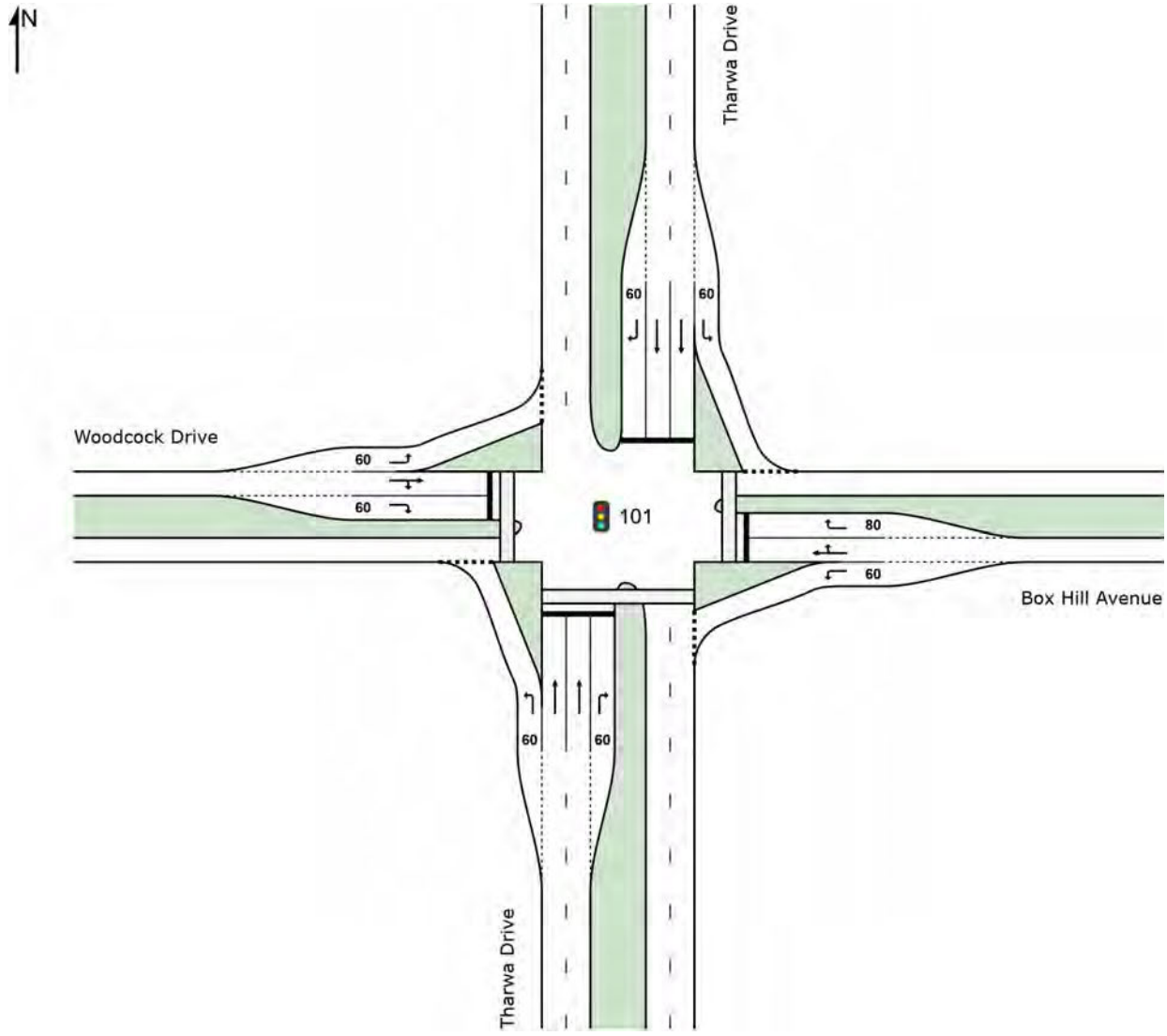
Site: 101 [2041_AM Peak_Tharwa Drive / Woodcock Drive - Signals]

Network: 8 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

Signalised Cross Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	77	2.3	77	2.3	0.055	5.8	LOS A	0.0	0.2	0.02	0.55	0.02	50.1
2	T1	963	2.3	963	2.3	0.828	15.6	LOS B	10.7	76.1	0.76	0.69	0.80	43.3
3	R2	2	2.3	2	2.3	0.017	51.6	LOS D	0.1	0.4	1.00	0.61	1.00	16.5
Approach		1042	2.3	1042	2.3	0.828	14.9	LOS B	10.7	76.1	0.71	0.68	0.74	43.6
East: Box Hill Avenue														
4	L2	14	2.3	14	2.3	0.011	7.0	LOS A	0.1	0.4	0.23	0.59	0.23	35.7
5	T1	99	2.3	99	2.3	0.837	39.6	LOS C	12.4	88.3	1.00	0.97	1.18	25.8
6	R2	762	2.3	762	2.3	0.837	45.2	LOS D	12.4	88.3	1.00	0.96	1.18	27.8
Approach		875	2.3	875	2.3	0.837	44.0	LOS D	12.4	88.3	0.99	0.95	1.17	27.6
North: Tharwa Drive														
7	L2	369	2.3	369	2.3	0.249	7.0	LOS A	1.7	12.3	0.27	0.63	0.27	49.8
8	T1	351	2.3	351	2.3	0.301	26.2	LOS B	3.6	26.0	0.81	0.67	0.81	32.2
9	R2	68	2.3	68	2.3	0.556	53.2	LOS D	1.9	13.8	1.00	0.77	1.04	29.7
Approach		788	2.3	788	2.3	0.556	19.6	LOS B	3.6	26.0	0.57	0.66	0.58	38.7
West: Woodcock Drive														
10	L2	125	2.3	125	2.3	0.160	18.1	LOS B	1.8	12.8	0.62	0.71	0.62	44.2
11	T1	136	2.3	136	2.3	0.787	48.9	LOS D	4.0	28.4	1.00	0.91	1.27	24.3
12	R2	58	2.3	58	2.3	0.353	49.6	LOS D	1.6	11.1	0.98	0.75	0.98	19.6
Approach		319	2.3	319	2.3	0.787	36.9	LOS C	4.0	28.4	0.85	0.80	0.96	30.9
All Vehicles		3024	2.3	3024	2.3	0.837	26.9	LOS B	12.4	88.3	0.77	0.77	0.85	35.1

[redacted]

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	77	2.3	77	2.3	1394	0.055	100	5.8	LOS A	0.0	0.2	Short	60	0.0	NA
Lane 2	482	2.3	482	2.3	582	0.828	100	11.8	LOS A	8.7	61.8	Full	165	0.0	0.0
Lane 3	481	2.3	481	2.3	581[1]	0.828	100	19.3	LOS B	10.7	76.1	Full	165	0.0	0.0
Lane 4	2	2.3	2	2.3	123	0.017	100	51.6	LOS D	0.1	0.4	Short	60	0.0	NA
Approach	1042	2.3	1042	2.3		0.828		14.9	LOS B	10.7	76.1				
East: Box Hill Avenue															
Lane 1	14	2.3	14	2.3	1259	0.011	100	7.0	LOS A	0.1	0.4	Short	60	0.0	NA
Lane 2	432	2.3	432	2.3	516[1]	0.837	100	43.9	LOS D	12.4	88.3	Full	150	0.0	1.4
Lane 3	429	2.3	429	2.3	513	0.837	100	45.3	LOS D	12.3	88.0	Short	80	0.0	NA
Approach	875	2.3	875	2.3		0.837		44.0	LOS D	12.4	88.3				
North: Tharwa Drive															
Lane 1	369	2.3	369	2.3	1482	0.249	100	7.0	LOS A	1.7	12.3	Short	60	0.0	NA
Lane 2	175	2.3	175	2.3	582	0.301	100	26.2	LOS B	3.6	26.0	Full	490	0.0	0.0
Lane 3	175	2.3	175	2.3	582	0.301	100	26.2	LOS B	3.6	26.0	Full	490	0.0	0.0
Lane 4	68	2.3	68	2.3	123	0.556	100	53.2	LOS D	1.9	13.8	Short	60	0.0	NA
Approach	788	2.3	788	2.3		0.556		19.6	LOS B	3.6	26.0				
West: Woodcock Drive															
Lane 1	125	2.3	125	2.3	783	0.160	100	18.1	LOS B	1.8	12.8	Short	60	0.0	NA
Lane 2	136	2.3	136	2.3	173	0.787	100	48.9	LOS D	4.0	28.4	Full	380	0.0	0.0
Lane 3	58	2.3	58	2.3	164	0.353	45[5]	49.6	LOS D	1.6	11.1	Short	60	0.0	NA
Approach	319	2.3	319	2.3		0.787		36.9	LOS C	4.0	28.4				
Intersection	3024	2.3	3024	2.3		0.837		26.9	LOS B	12.4	88.3				

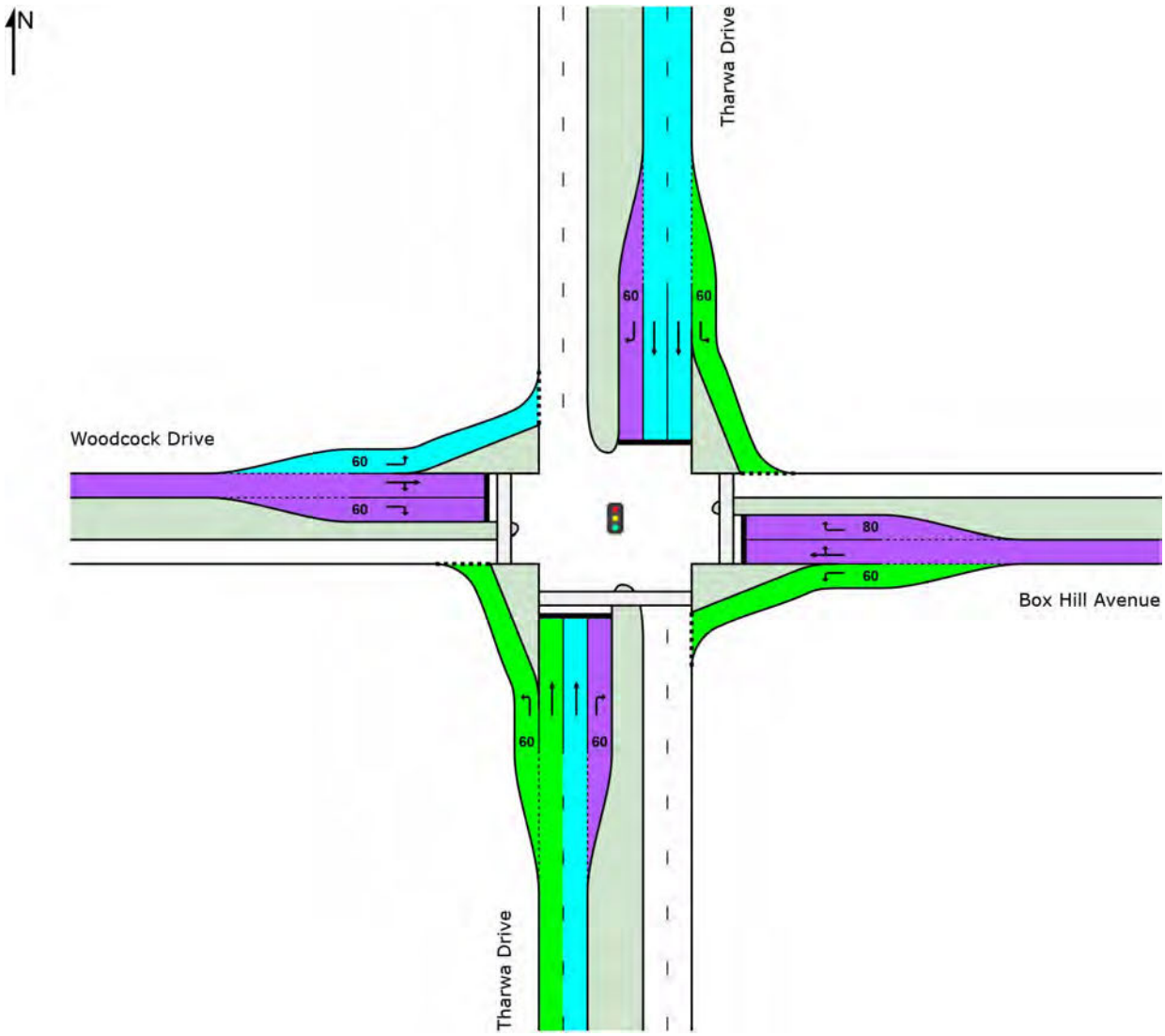
[redacted]

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	B	D	B	C	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

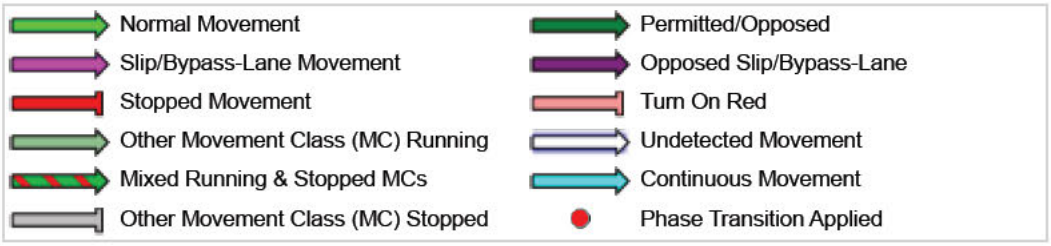
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	84	27	58	72
Green Time (sec)	27	25	8	6
Phase Time (sec)	33	31	14	12
Phase Split	37%	34%	16%	13%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase



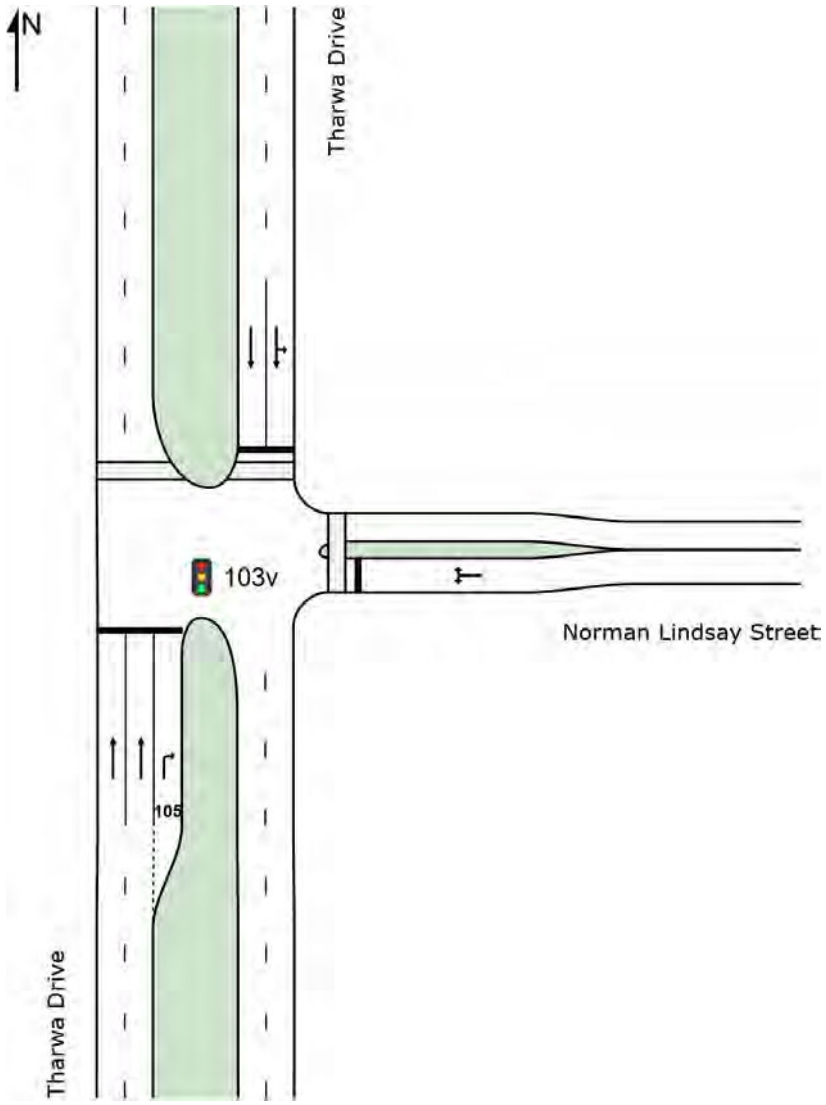
Site: 103v [2041_AM Peak_Tharwa Drive / Norman Lindsay Street - Signals]

Network: 8 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

Signalised T-Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	889	2.3	889	2.3	0.408	9.8	LOS A	5.2	37.1	0.47	0.41	0.47	47.9
3	R2	151	2.3	151	2.3	0.390	39.1	LOS C	3.6	26.0	0.93	0.79	0.93	30.1
Approach		1040	2.3	1040	2.3	0.408	14.1	LOS A	5.2	37.1	0.54	0.47	0.54	43.9
East: Norman Lindsay Street														
4	L2	79	2.3	79	2.3	0.406	30.8	LOS C	5.0	35.6	0.84	0.79	0.84	5.7
6	R2	152	2.3	152	2.3	0.406	30.7	LOS C	5.0	35.6	0.84	0.79	0.84	5.7
Approach		231	2.3	231	2.3	0.406	30.7	LOS C	5.0	35.6	0.84	0.79	0.84	5.7
North: Tharwa Drive														
7	L2	143	2.3	143	2.3	0.388	31.7	LOS C	3.9	27.9	0.73	0.72	0.73	9.4
8	T1	280	2.3	280	2.3	0.388	27.4	LOS B	4.7	33.4	0.82	0.71	0.82	16.3
Approach		423	2.3	423	2.3	0.388	28.9	LOS C	4.7	33.4	0.79	0.71	0.79	12.7
All Vehicles		1694	2.3	1694	2.3	0.408	20.0	LOS B	5.2	37.1	0.64	0.57	0.64	32.3

[redacted]

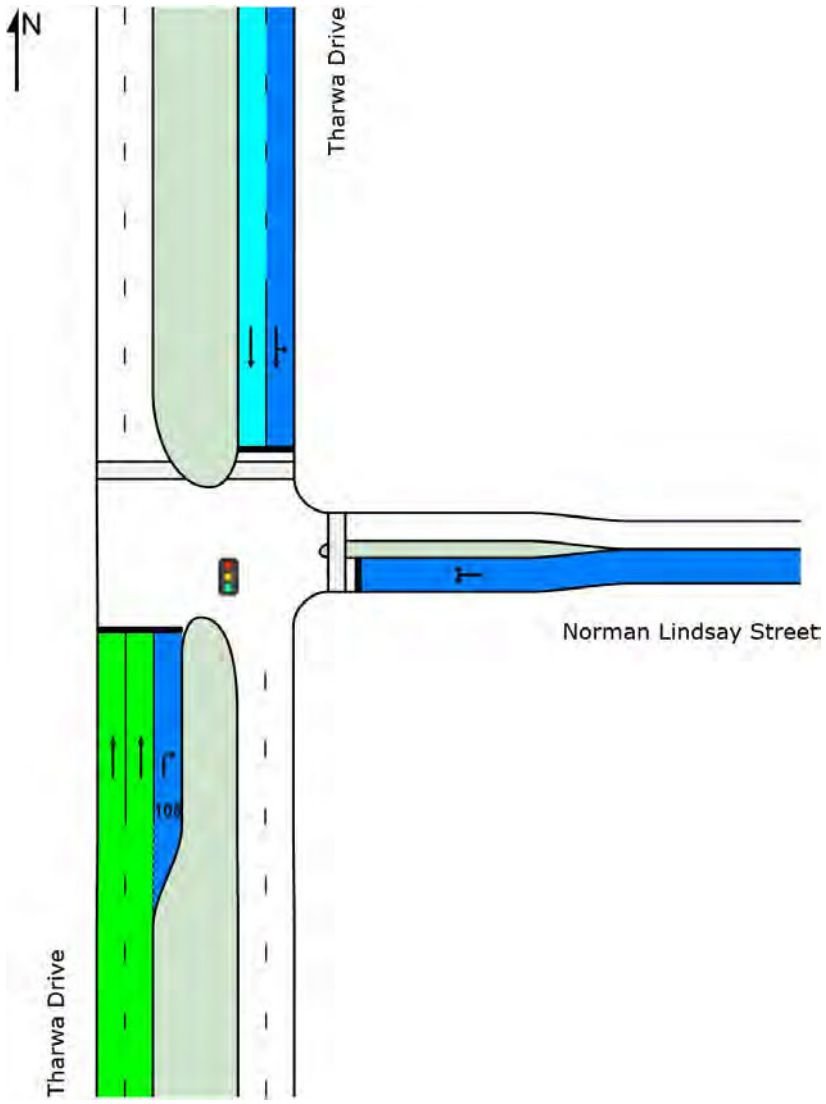
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	445	2.3	445	2.3	1089	0.408	100	9.8	LOS A	5.2	37.1	Full	640	0.0	0.0
Lane 2	445	2.3	445	2.3	1089	0.408	100	9.8	LOS A	5.2	37.1	Full	640	0.0	0.0
Lane 3	151	2.3	151	2.3	386	0.390	100	39.1	LOS C	3.6	26.0	Short	105	0.0	NA
Approach	1040	2.3	1040	2.3		0.408		14.1	LOS A	5.2	37.1				
East: Norman Lindsay Street															
Lane 1	231	2.3	231	2.3	568	0.406	100	30.7	LOS C	5.0	35.6	Full	40	0.0	39.1
Approach	231	2.3	231	2.3		0.406		30.7	LOS C	5.0	35.6				
North: Tharwa Drive															
Lane 1	208	2.3	208	2.3	536	0.388	100	29.9	LOS C	3.9	27.9	Full	165	0.0	0.0
Lane 2	215	2.3	215	2.3	555	0.388	100	27.8	LOS B	4.7	33.4	Full	165	0.0	0.0
Approach	423	2.3	423	2.3		0.388		28.9	LOS C	4.7	33.4				
Intersection	1694	2.3	1694	2.3		0.408		20.0	LOS B	5.2	37.1				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	C	C	B



Colour code based on Level of Service

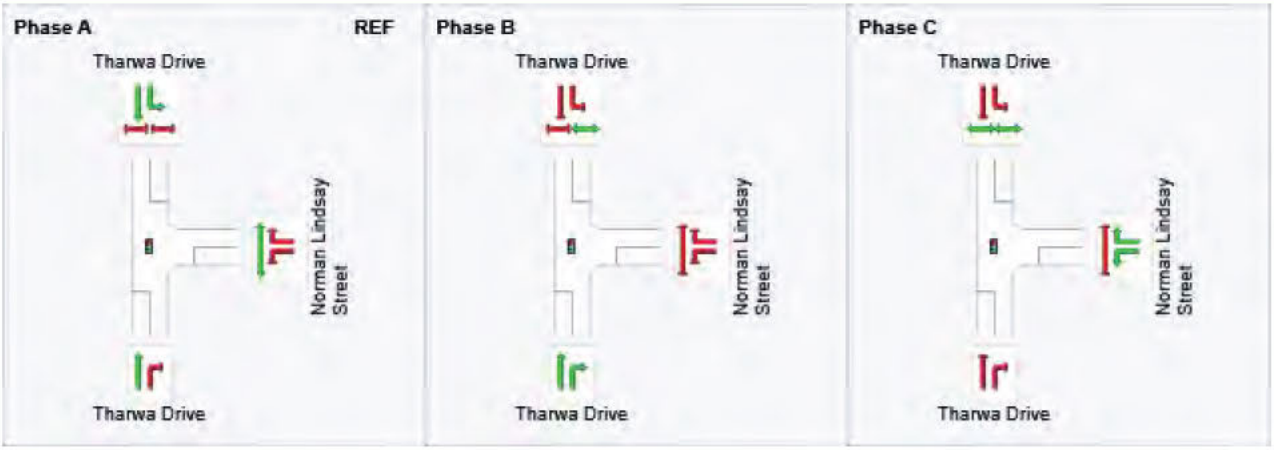
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

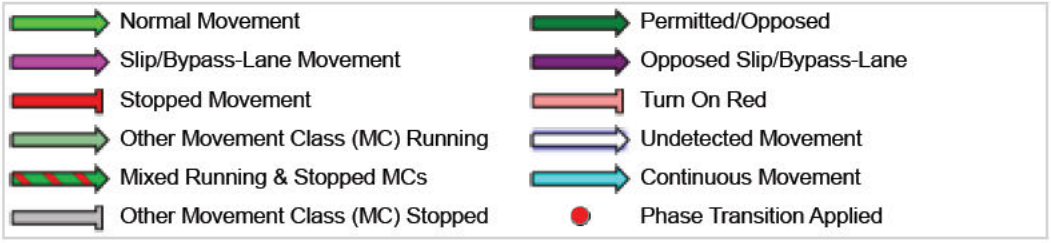
Phase	A	B	C
Phase Change Time (sec)	74	16	41
Green Time (sec)	26	19	27
Phase Time (sec)	32	25	33
Phase Split	36%	28%	37%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



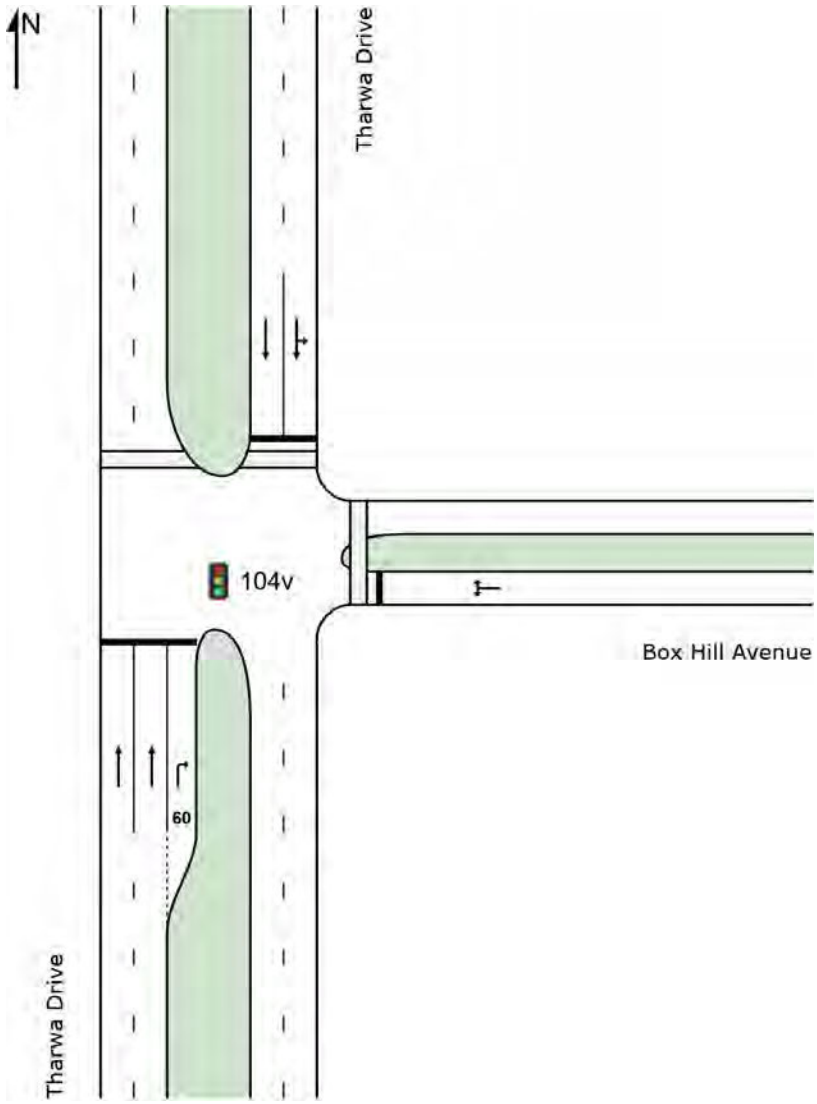
Site: 104v [2041_AM Peak_Tharwa Drive / Box Hill Avenue - Signals]

Network: 8 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

Signalised Cross Intersection
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	491	2.3	491	2.3	0.396	32.8	LOS C	6.4	45.9	0.97	0.81	0.97	38.8
3	R2	48	2.3	48	2.3	0.393	54.5	LOS D	1.4	9.9	1.00	0.74	1.00	32.5
Approach		539	2.3	539	2.3	0.396	34.8	LOS C	6.4	45.9	0.97	0.81	0.97	38.1
East: Box Hill Avenue														
4	L2	19	2.3	19	2.3	0.542	19.2	LOS B	9.7	69.2	0.68	0.79	0.68	16.5
6	R2	552	2.3	552	2.3	0.542	19.2	LOS B	9.7	69.2	0.68	0.79	0.68	16.5
Approach		571	2.3	571	2.3	0.542	19.2	LOS B	9.7	69.2	0.68	0.79	0.68	16.5
North: Tharwa Drive														
7	L2	186	2.3	186	2.3	0.553	43.0	LOS D	4.8	34.1	0.97	0.81	0.97	30.3
8	T1	161	2.3	161	2.3	0.455	36.6	LOS C	3.9	28.0	0.93	0.75	0.93	31.0
Approach		347	2.3	347	2.3	0.553	40.0	LOS C	4.8	34.1	0.95	0.78	0.95	30.6
All Vehicles		1457	2.3	1457	2.3	0.553	29.9	LOS C	9.7	69.2	0.86	0.80	0.86	32.4

[redacted]

Lane Use and Performance

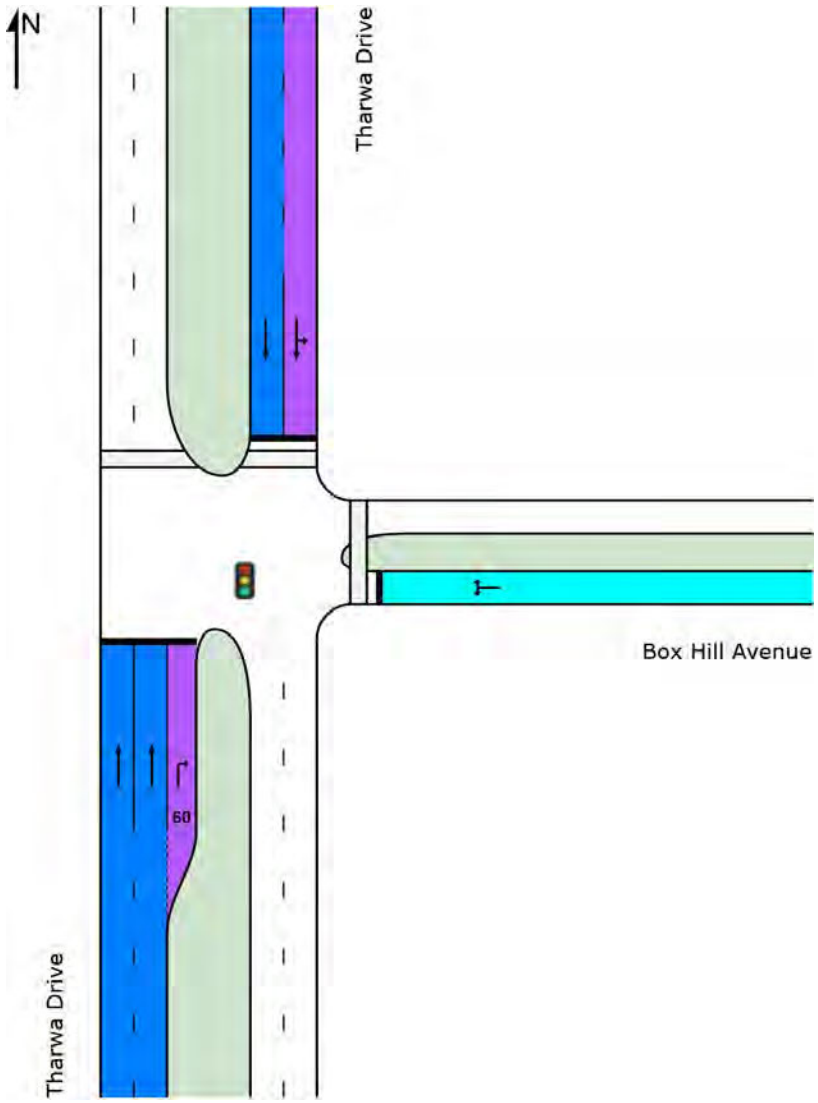
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane	Average	Level of	Aver. Back of Queue		Lane	Lane	Cap.	Prob.
	Total	HV	Total	HV			Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: Tharwa Drive															
Lane 1	245	2.3	245	2.3	619	0.396	100	29.4	LOS C	5.9	42.0	Full	990	0.0	0.0
Lane 2	245	2.3	245	2.3	619	0.396	100	36.3	LOS C	6.4	45.9	Full	990	0.0	0.0
Lane 3	48	2.3	48	2.3	123	0.393	100	54.5	LOS D	1.4	9.9	Short	60	0.0	NA
Approach	539	2.3	539	2.3		0.396		34.8	LOS C	6.4	45.9				
East: Box Hill Avenue															
Lane 1	571	2.3	571	2.3	1052	0.542	100	19.2	LOS B	9.7	69.2	Full	105	0.0	11.6
Approach	571	2.3	571	2.3		0.542		19.2	LOS B	9.7	69.2				
North: Tharwa Drive															
Lane 1	186	2.3	186	2.3	337	0.553	100	43.0	LOS D	4.8	34.1	Full	640	0.0	0.0
Lane 2	161	2.3	161	2.3	354	0.455	82[5]	36.6	LOS C	3.9	28.0	Full	640	0.0	0.0
Approach	347	2.3	347	2.3		0.553		40.0	LOS C	4.8	34.1				
Intersection	1457	2.3	1457	2.3		0.553		29.9	LOS C	9.7	69.2				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	C	B	C	C



Colour code based on Level of Service

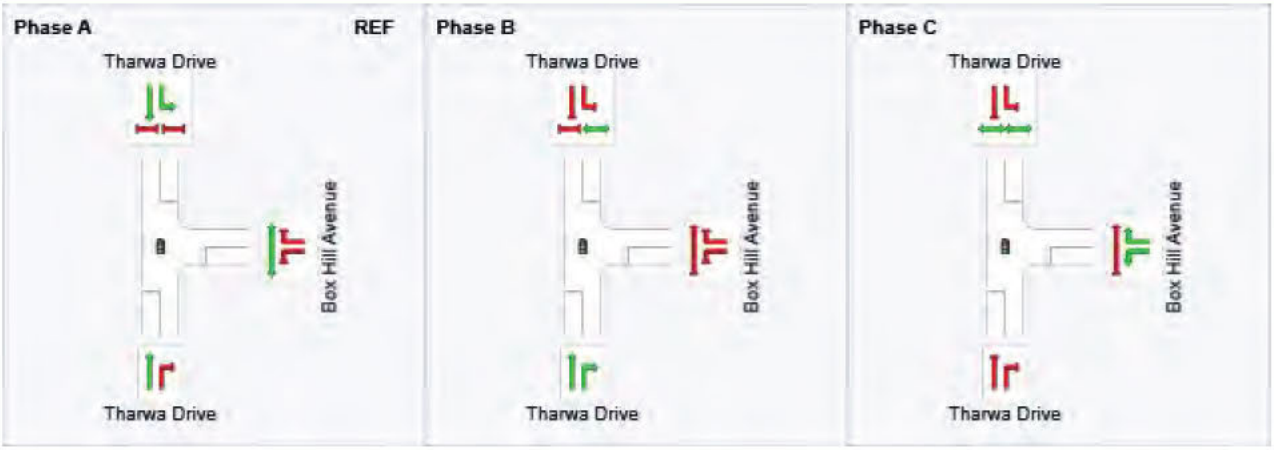
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

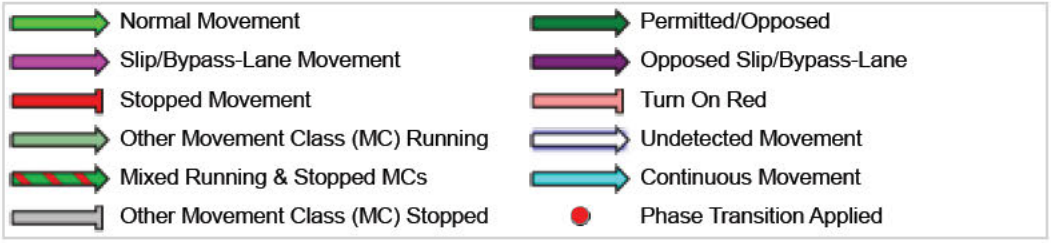
Phase	A	B	C
Phase Change Time (sec)	45	67	79
Green Time (sec)	16	6	50
Phase Time (sec)	22	12	56
Phase Split	24%	13%	62%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



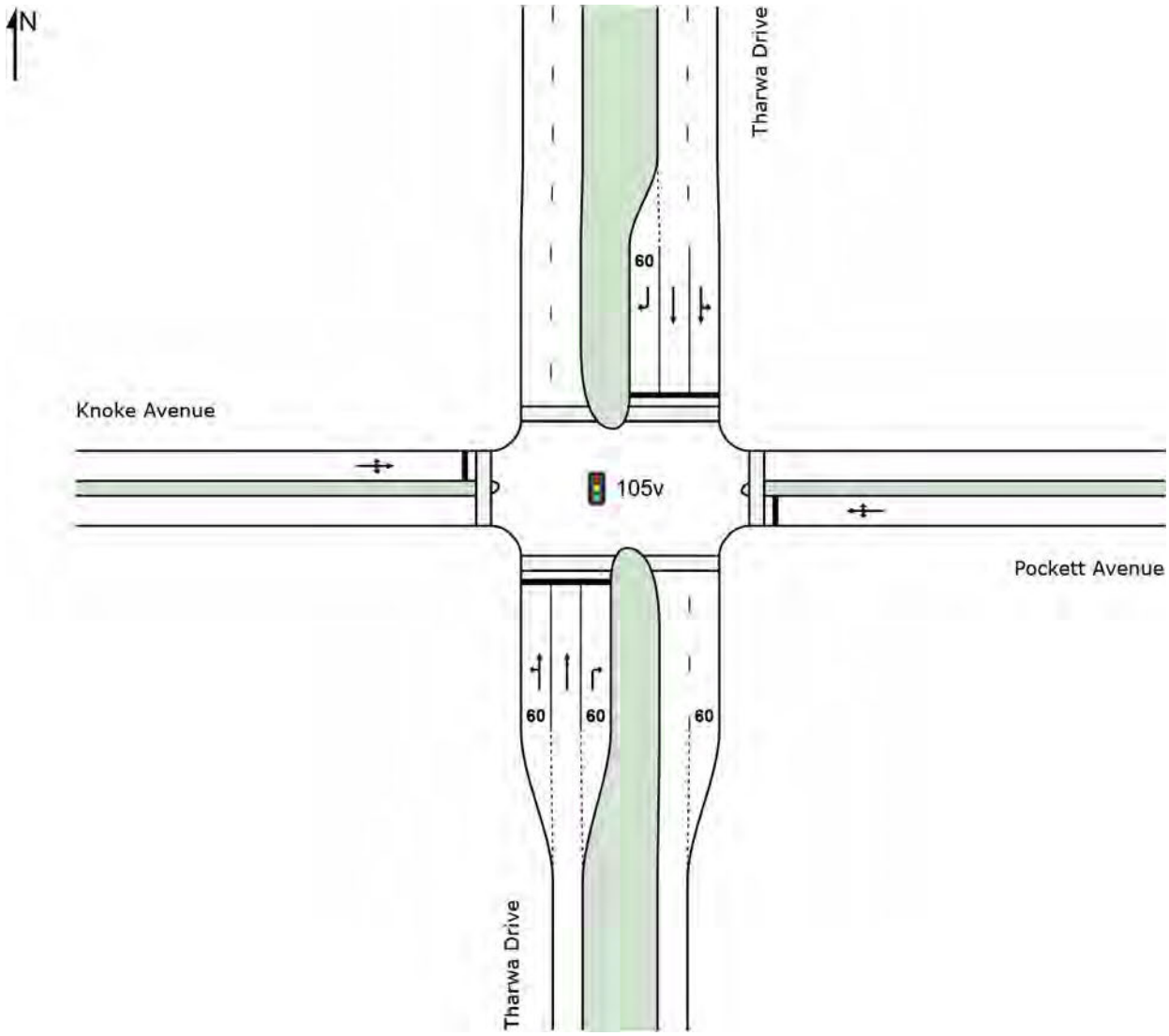
Site: 105v [2041_AM Peak_Tharwa Drive / Pockett Avenue - Signals]

Network: 8 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

Signalised Cross Intersection - Duplicated
Site Category: AM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Diamond Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	1	2.3	1	2.3	0.146	48.1	LOS D	0.7	4.8	0.95	0.68	0.95	15.5
2	T1	51	2.3	51	2.3	0.146	42.5	LOS D	0.7	4.8	0.95	0.68	0.95	25.1
3	R2	1	2.3	1	2.3	0.007	47.6	LOS D	0.0	0.2	0.94	0.59	0.94	24.9
Approach		53	2.3	53	2.3	0.146	42.7	LOS D	0.7	4.8	0.95	0.68	0.95	24.7
East: Pockett Avenue														
4	L2	2	2.3	2	2.3	0.507	32.0	LOS C	6.8	48.7	0.86	0.81	0.86	31.2
5	T1	27	2.3	27	2.3	0.507	26.8	LOS B	6.8	48.7	0.86	0.81	0.86	16.2
6	R2	281	2.3	281	2.3	0.507	32.0	LOS C	6.8	48.7	0.86	0.81	0.86	9.6
Approach		311	2.3	311	2.3	0.507	31.5	LOS C	6.8	48.7	0.86	0.81	0.86	10.5
North: Tharwa Drive														
7	L2	74	2.3	74	2.3	0.438	42.5	LOS C	1.8	12.7	0.88	0.74	0.88	35.4
8	T1	36	2.3	36	2.3	0.202	34.7	LOS C	0.8	5.6	0.81	0.59	0.81	43.3
9	R2	59	2.3	59	2.3	0.400	46.3	LOS D	1.5	10.7	0.92	0.74	0.92	34.5
Approach		168	2.3	168	2.3	0.438	42.2	LOS C	1.8	12.7	0.88	0.71	0.88	36.9
West: Knoke Avenue														
10	L2	199	2.3	199	2.3	0.499	37.6	LOS C	5.5	39.1	0.91	0.80	0.91	9.2
11	T1	31	2.3	31	2.3	0.499	32.0	LOS C	5.5	39.1	0.91	0.80	0.91	14.3
12	R2	3	2.3	3	2.3	0.499	37.6	LOS C	5.5	39.1	0.91	0.80	0.91	29.4
Approach		233	2.3	233	2.3	0.499	36.9	LOS C	5.5	39.1	0.91	0.80	0.91	10.4
All Vehicles		764	2.3	764	2.3	0.507	36.3	LOS C	6.8	48.7	0.89	0.77	0.89	22.9

[redacted]

Lane Use and Performance

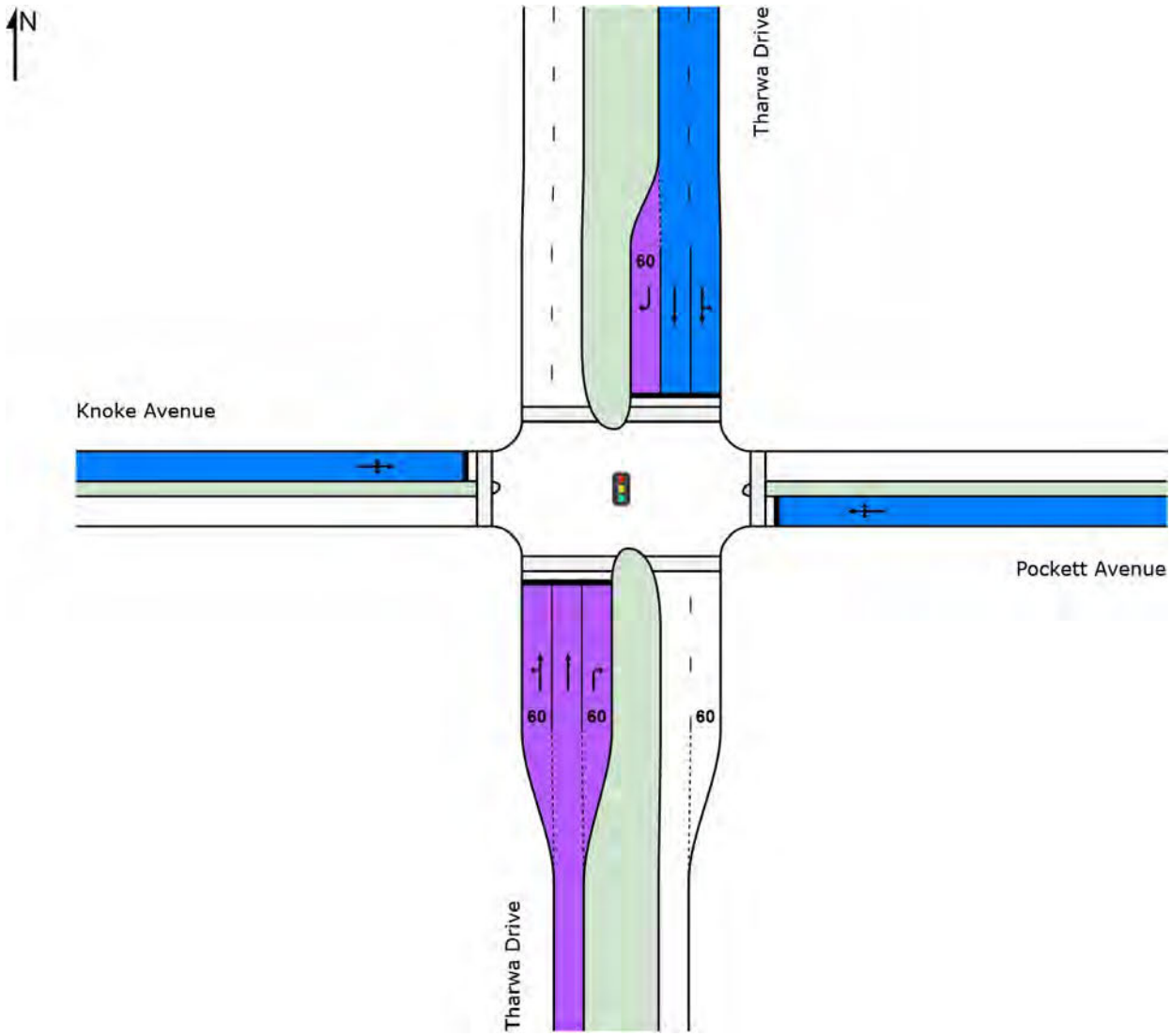
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	26	2.3	26	2.3	177	0.146	100	42.7	LOS D	0.7	4.8	Short	60	0.0	NA
Lane 2	26	2.3	26	2.3	177	0.146	100	42.5	LOS D	0.7	4.8	Full	500	0.0	0.0
Lane 3	1	2.3	1	2.3	147	0.007	100	47.6	LOS D	0.0	0.2	Short	60	0.0	NA
Approach	53	2.3	53	2.3		0.146		42.7	LOS D	0.7	4.8				
East: Pockett Avenue															
Lane 1	311	2.3	311	2.3	613	0.507	100	31.5	LOS C	6.8	48.7	Full	80	0.0	4.4
Approach	311	2.3	311	2.3		0.507		31.5	LOS C	6.8	48.7				
North: Tharwa Drive															
Lane 1	74	2.3	74	2.3	168	0.438	100	42.5	LOS C	1.8	12.7	Full	990	0.0	0.0
Lane 2	36	2.3	36	2.3	177	0.202	46[5]	34.7	LOS C	0.8	5.6	Full	990	0.0	0.0
Lane 3	59	2.3	59	2.3	147	0.400	100	46.3	LOS D	1.5	10.7	Short	60	0.0	NA
Approach	168	2.3	168	2.3		0.438		42.2	LOS C	1.8	12.7				
West: Knoke Avenue															
Lane 1	233	2.3	233	2.3	466	0.499	100	36.9	LOS C	5.5	39.1	Full	95	0.0	0.0
Approach	233	2.3	233	2.3		0.499		36.9	LOS C	5.5	39.1				
Intersection	764	2.3	764	2.3		0.507		36.3	LOS C	6.8	48.7				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	D	C	C	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

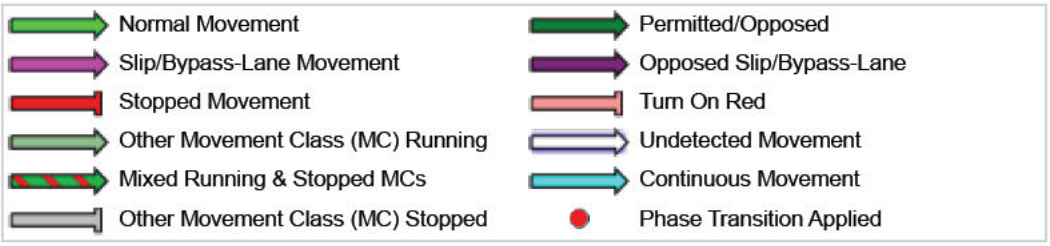
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	14	27	62
Green Time (sec)	8	7	29	22
Phase Time (sec)	14	13	35	28
Phase Split	16%	14%	39%	31%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase



DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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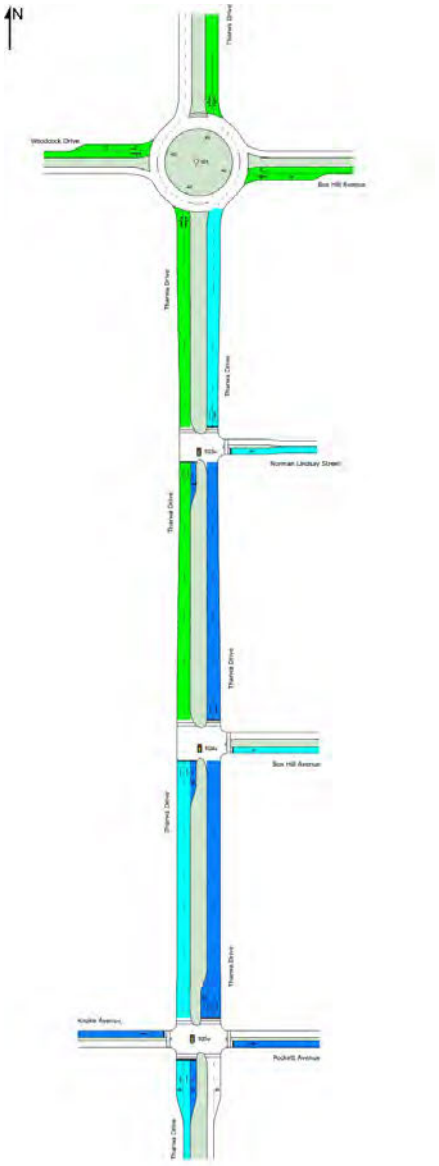
LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op2]

2041 Future Conditions - Upgraded Layout Option 2
Network Category: (None)
Network Cycle Time = 60 seconds (Network User-Given Cycle Time)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

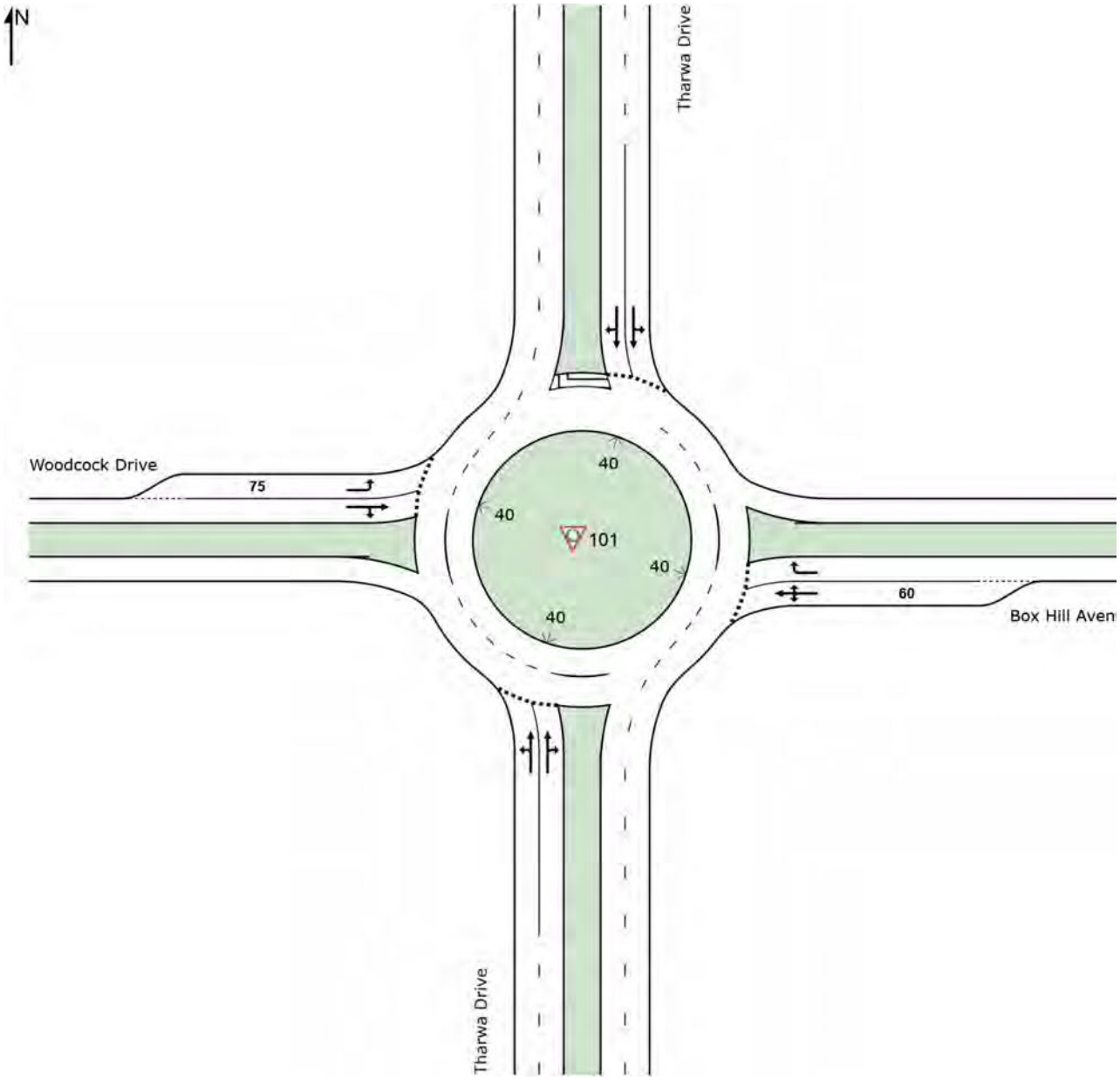
Template: Default Site User Report (2)

Site: 101 [2041_AM Peak_Tharwa Drive / Woodcock Drive - Duplicated w, Ped Xing]

Network: 10 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

Two Lane Roundabout with ped xing to south - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	77	2.3	77	2.3	0.602	6.9	LOS A	1.7	12.1	0.75	0.84	0.93	48.5
2	T1	963	2.3	963	2.3	0.602	7.2	LOS A	1.7	12.1	0.76	0.87	0.95	53.0
3	R2	2	2.3	2	2.3	0.602	14.1	LOS A	1.6	11.3	0.76	0.91	0.97	38.6
Approach		1042	2.3	1042	2.3	0.602	7.2	LOS A	1.7	12.1	0.76	0.87	0.95	52.7
East: Box Hill Avenue														
4	L2	14	2.3	14	2.3	0.406	4.8	LOS A	0.9	6.4	0.56	0.70	0.56	34.0
5	T1	99	2.3	99	2.3	0.406	4.7	LOS A	0.9	6.4	0.56	0.70	0.56	49.3
6	R2	762	2.3	762	2.3	0.406	11.3	LOS A	0.9	6.4	0.57	0.74	0.57	50.7
Approach		875	2.3	875	2.3	0.406	10.4	LOS A	0.9	6.4	0.57	0.73	0.57	50.4
North: Tharwa Drive														
7	L2	369	2.3	369	2.3	0.278	3.7	LOS A	0.8	5.8	0.44	0.45	0.44	53.3
8	T1	351	2.3	351	2.3	0.278	3.4	LOS A	0.8	5.8	0.46	0.44	0.46	50.2
9	R2	68	2.3	68	2.3	0.278	10.4	LOS A	0.8	5.5	0.46	0.43	0.46	56.9
Approach		788	2.3	788	2.3	0.278	4.2	LOS A	0.8	5.8	0.45	0.44	0.45	52.5
West: Woodcock Drive														
10	L2	125	2.3	125	2.3	0.228	8.4	LOS A	0.4	3.0	0.76	0.85	0.76	52.2
11	T1	136	2.3	136	2.3	0.239	6.2	LOS A	0.5	3.6	0.77	0.74	0.77	50.5
12	R2	58	2.3	58	2.3	0.239	13.1	LOS A	0.5	3.6	0.77	0.74	0.77	44.4
Approach		319	2.3	319	2.3	0.239	8.3	LOS A	0.5	3.6	0.77	0.78	0.77	50.5
All Vehicles		3024	2.3	3024	2.3	0.602	7.5	LOS A	1.7	12.1	0.62	0.71	0.69	51.7

[redacted]

Lane Use and Performance

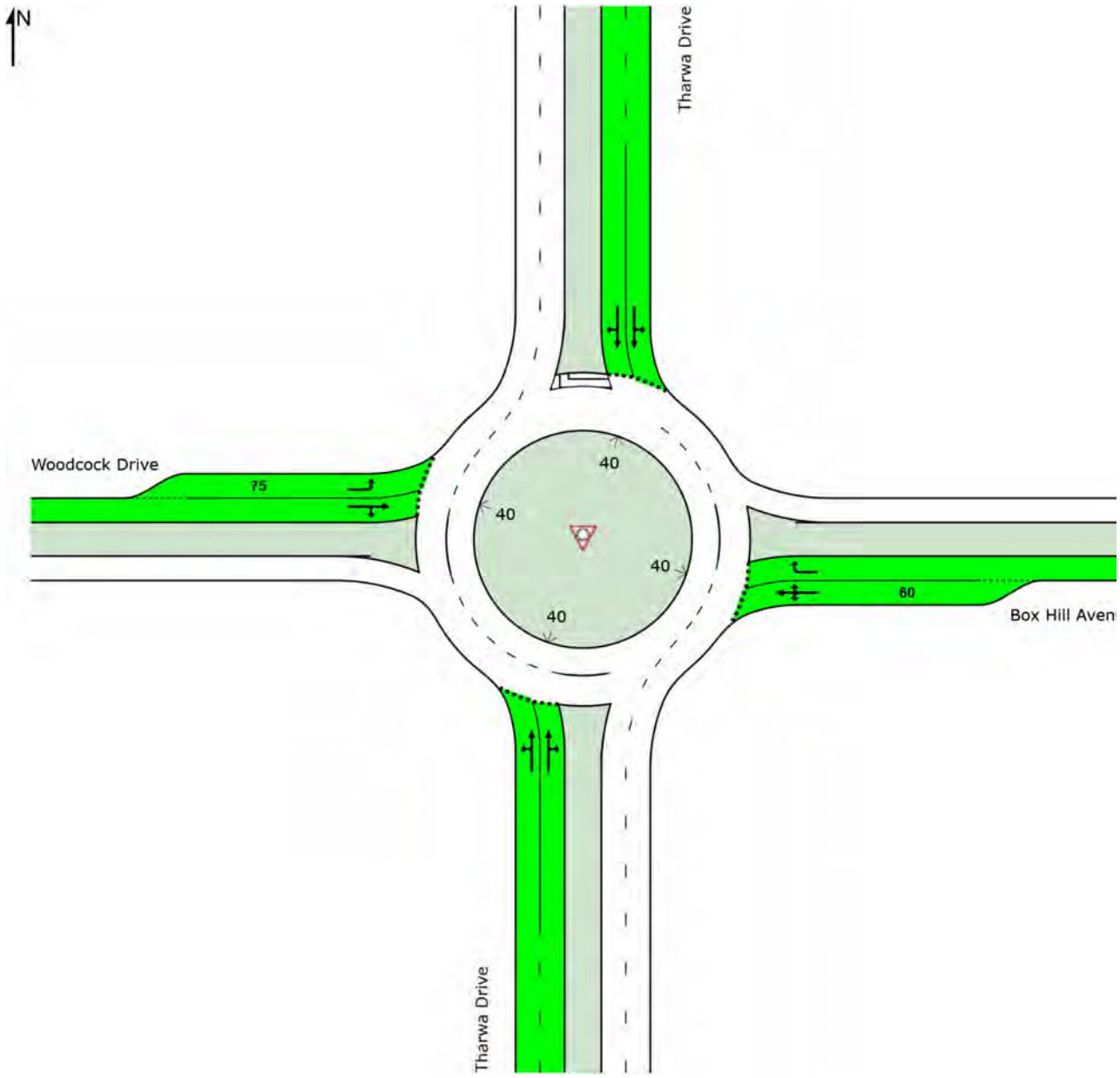
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	582	2.3	582	2.3	968	0.602	100	6.7	LOS A	1.7	12.1	Full	75	0.0	0.0
Lane 2	460	2.3	460	2.3	765	0.602	100	7.9	LOS A	1.6	11.3	Full	75	0.0	0.0
Approach	1042	2.3	1042	2.3		0.602		7.2	LOS A	1.7	12.1				
East: Box Hill Avenue															
Lane 1[d]	474	2.3	474	2.3	1168	0.406	100	9.6	LOS A	0.9	6.4	Short	60	0.0	NA
Lane 2	401	2.3	401	2.3	988	0.406	100	11.5	LOS A	0.9	6.1	Full	150	0.0	0.0
Approach	875	2.3	875	2.3		0.406		10.4	LOS A	0.9	6.4				
North: Tharwa Drive															
Lane 1[d]	436	2.3	436	2.3	1565	0.278	100	3.6	LOS A	0.8	5.8	Full	490	0.0	0.0
Lane 2	353	2.3	353	2.3	1267	0.278	100	4.8	LOS A	0.8	5.5	Full	490	0.0	0.0
Approach	788	2.3	788	2.3		0.278		4.2	LOS A	0.8	5.8				
West: Woodcock Drive															
Lane 1	125	2.3	125	2.3	549	0.228	100	8.4	LOS A	0.4	3.0	Short	75	0.0	NA
Lane 2[d]	194	2.3	194	2.3	809	0.239	100	8.2	LOS A	0.5	3.6	Full	380	0.0	0.0
Approach	319	2.3	319	2.3		0.239		8.3	LOS A	0.5	3.6				
Intersection	3024	2.3	3024	2.3		0.602		7.5	LOS A	1.7	12.1				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

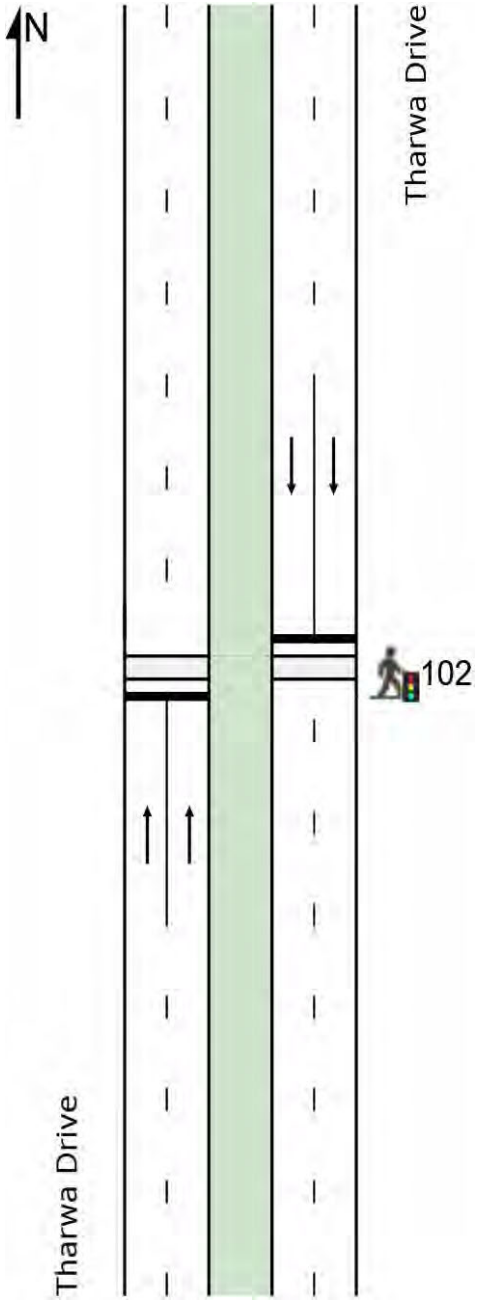
Site: 102 [2041_AM Peak_Tharwa Drive Pedestrian Crossing - Duplicated]

Network: 10 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

Pedestrian Crossing - Duplicated
Site Category: AM Peak 2041 Conditions
Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 75 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	1042	2.3	1042	2.3	0.293	0.6	LOS A	1.7	11.8	0.16	0.14	0.16	53.7
Approach		1042	2.3	1042	2.3	0.293	0.6	LOS A	1.7	11.8	0.16	0.14	0.16	53.7
North: Tharwa Drive														
8	T1	422	2.3	422	2.3	0.119	0.5	LOS A	0.6	3.9	0.13	0.11	0.13	54.6
Approach		422	2.3	422	2.3	0.119	0.5	LOS A	0.6	3.9	0.13	0.11	0.13	54.6
All Vehicles		1464	2.3	1464	2.3	0.293	0.6	LOS A	1.7	11.8	0.15	0.13	0.15	53.9

[redacted]

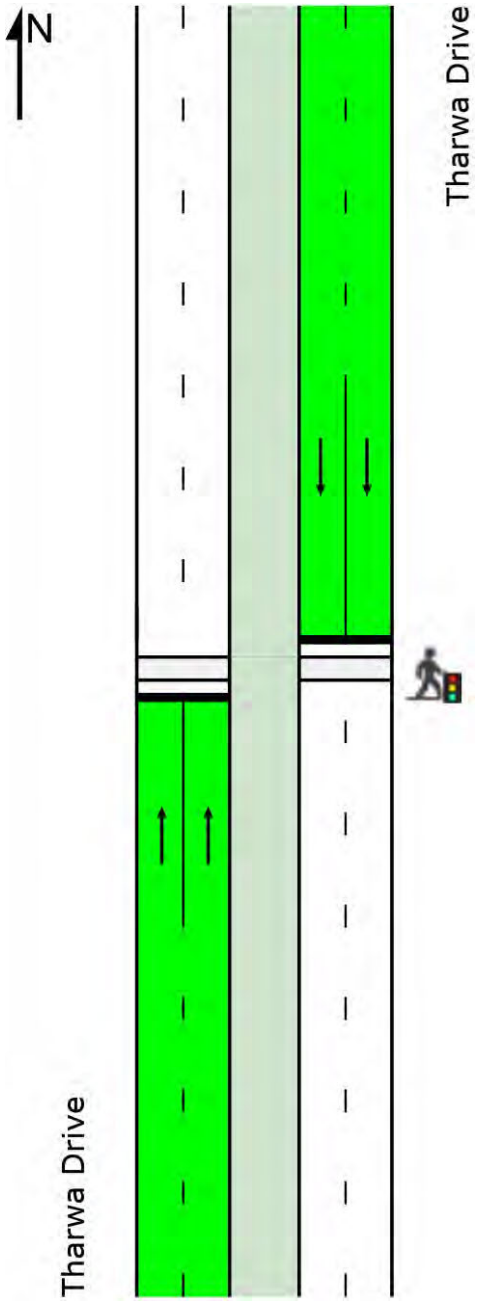
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	521	2.3	521	2.3	1779	0.293	100	0.6	LOS A	1.7	11.8	Full	80	0.0	0.0
Lane 2	521	2.3	521	2.3	1779	0.293	100	0.6	LOS A	1.7	11.8	Full	80	0.0	0.0
Approach	1042	2.3	1042	2.3		0.293		0.6	LOS A	1.7	11.8				
North: Tharwa Drive															
Lane 1	211	2.3	211	2.3	1779	0.119	100	0.5	LOS A	0.6	3.9	Full	75	0.0	0.0
Lane 2	211	2.3	211	2.3	1779	0.119	100	0.5	LOS A	0.6	3.9	Full	75	0.0	0.0
Approach	422	2.3	422	2.3		0.119		0.5	LOS A	0.6	3.9				
Intersection	1464	2.3	1464	2.3		0.293		0.6	LOS A	1.7	11.8				

[redacted]

Lane Level of Service

	Approaches		Intersection
	South	North	
LOS	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

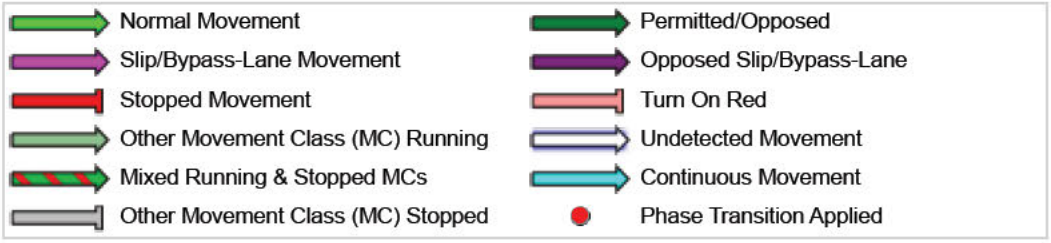
Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	73
Green Time (sec)	67	1
Phase Time (sec)	68	7
Phase Split	91%	9%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

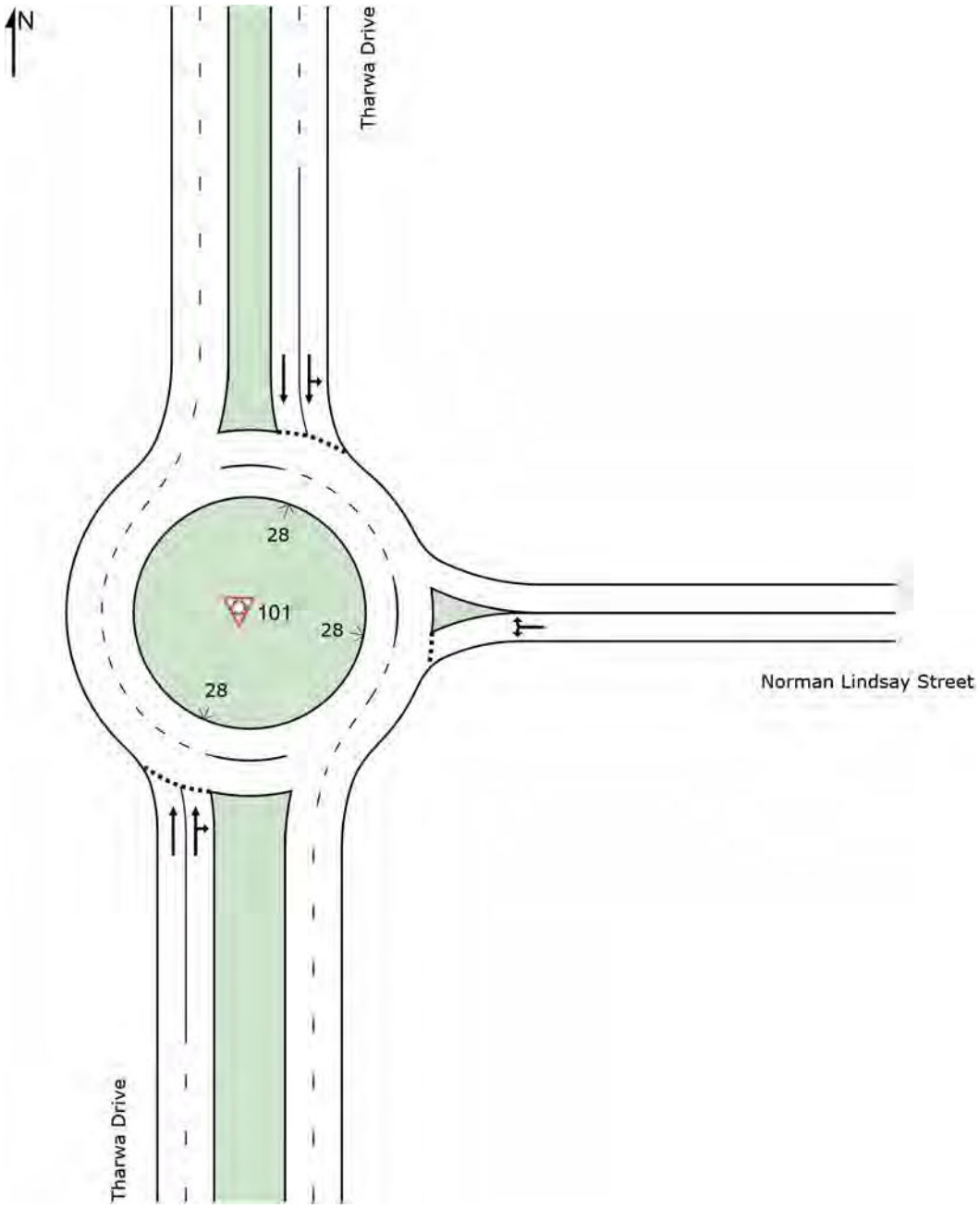


Site: 101 [2041_AM Peak_Tharwa Drive / Norman Lindsay Street - Roundabout]

Network: 10 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

Dual lane roundabout with ped xing to north - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	889	2.3	889	2.3	0.389	4.4	LOS A	1.0	6.9	0.36	0.46	0.36	51.8
3	R2	151	2.3	151	2.3	0.389	9.9	LOS A	1.0	6.8	0.37	0.51	0.37	49.8
Approach		1040	2.3	1040	2.3	0.389	5.2	LOS A	1.0	6.9	0.36	0.47	0.36	51.5
East: Norman Lindsay Street														
4	L2	79	2.3	79	2.3	0.218	3.1	LOS A	0.4	2.8	0.40	0.66	0.40	27.4
6	R2	152	2.3	152	2.3	0.218	8.4	LOS A	0.4	2.8	0.40	0.66	0.40	27.4
Approach		231	2.3	231	2.3	0.218	6.6	LOS A	0.4	2.8	0.40	0.66	0.40	27.4
North: Tharwa Drive														
7	L2	143	2.3	143	2.3	0.171	3.8	LOS A	0.3	2.2	0.28	0.45	0.28	14.6
8	T1	280	2.3	280	2.3	0.171	3.8	LOS A	0.3	2.2	0.29	0.42	0.29	35.9
Approach		423	2.3	423	2.3	0.171	3.8	LOS A	0.3	2.2	0.28	0.43	0.28	23.0
All Vehicles		1694	2.3	1694	2.3	0.389	5.0	LOS A	1.0	6.9	0.35	0.48	0.35	46.4

[redacted]

Lane Use and Performance

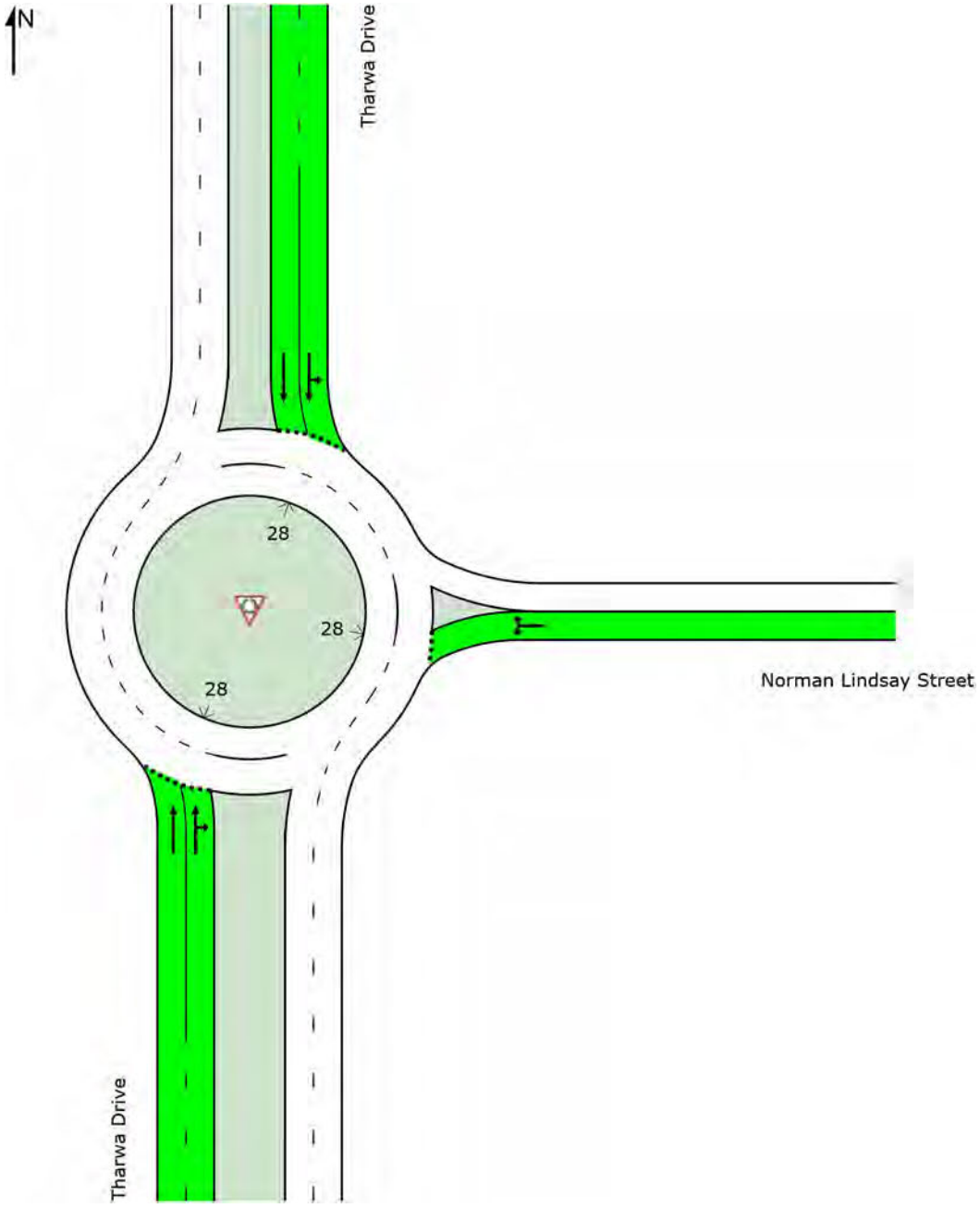
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	545	2.3	545	2.3	1403	0.389	100	4.3	LOS A	1.0	6.9	Full	640	0.0	0.0
Lane 2	495	2.3	495	2.3	1272	0.389	100	6.1	LOS A	1.0	6.8	Full	640	0.0	0.0
Approach	1040	2.3	1040	2.3		0.389		5.2	LOS A	1.0	6.9				
East: Norman Lindsay Street															
Lane 1[d]	231	2.3	231	2.3	1058	0.218	100	6.6	LOS A	0.4	2.8	Full	40	0.0	0.0
Approach	231	2.3	231	2.3		0.218		6.6	LOS A	0.4	2.8				
North: Tharwa Drive															
Lane 1[d]	220	2.3	220	2.3	1282	0.171	100	3.8	LOS A	0.3	2.2	Full	80	0.0	0.0
Lane 2	203	2.3	203	2.3	1187	0.171	100	3.8	LOS A	0.3	2.2	Full	80	0.0	0.0
Approach	423	2.3	423	2.3		0.171		3.8	LOS A	0.3	2.2				
Intersection	1694	2.3	1694	2.3		0.389		5.0	LOS A	1.0	6.9				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

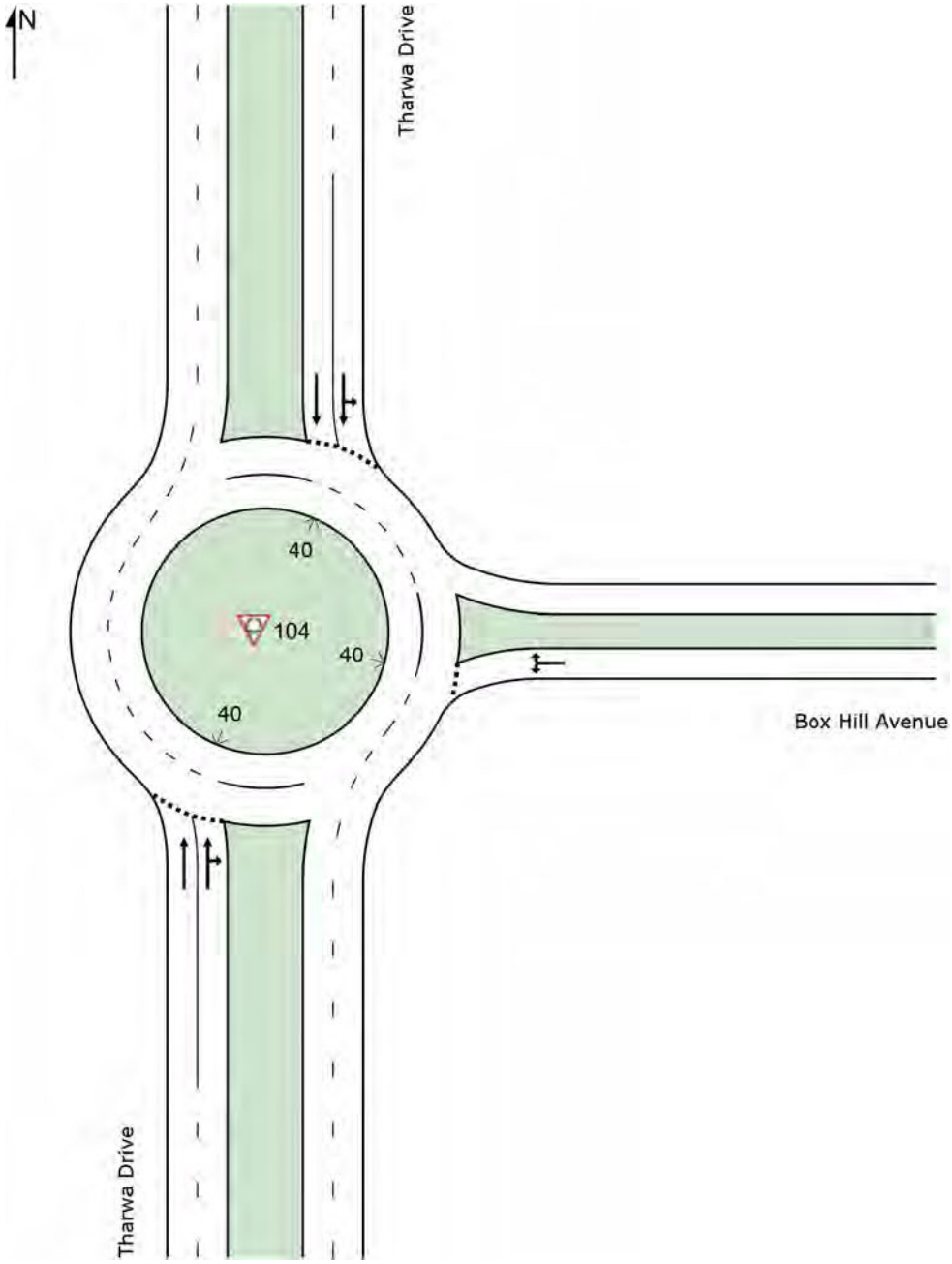
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 104 [2041_AM Peak_Tharwa Drive / Box Hill Avenue - Roundabout]

Network: 10 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

Dual Lane Roundabout - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	491	2.3	491	2.3	0.268	5.2	LOS A	0.7	4.6	0.62	0.56	0.62	53.7
3	R2	48	2.3	48	2.3	0.268	12.1	LOS A	0.6	4.4	0.62	0.62	0.62	52.5
Approach		539	2.3	539	2.3	0.268	5.8	LOS A	0.7	4.6	0.62	0.56	0.62	53.5
East: Box Hill Avenue														
4	L2	19	2.3	19	2.3	0.452	3.9	LOS A	1.1	7.9	0.39	0.63	0.39	30.6
6	R2	552	2.3	552	2.3	0.452	10.3	LOS A	1.1	7.9	0.39	0.63	0.39	30.6
Approach		571	2.3	571	2.3	0.452	10.1	LOS A	1.1	7.9	0.39	0.63	0.39	30.6
North: Tharwa Drive														
7	L2	186	2.3	186	2.3	0.120	3.3	LOS A	0.2	1.8	0.16	0.39	0.16	55.4
8	T1	161	2.3	161	2.3	0.116	2.9	LOS A	0.2	1.7	0.16	0.29	0.16	54.9
Approach		347	2.3	347	2.3	0.120	3.1	LOS A	0.2	1.8	0.16	0.34	0.16	55.2
All Vehicles		1457	2.3	1457	2.3	0.452	6.9	LOS A	1.1	7.9	0.42	0.54	0.42	49.6

[redacted]

Lane Use and Performance

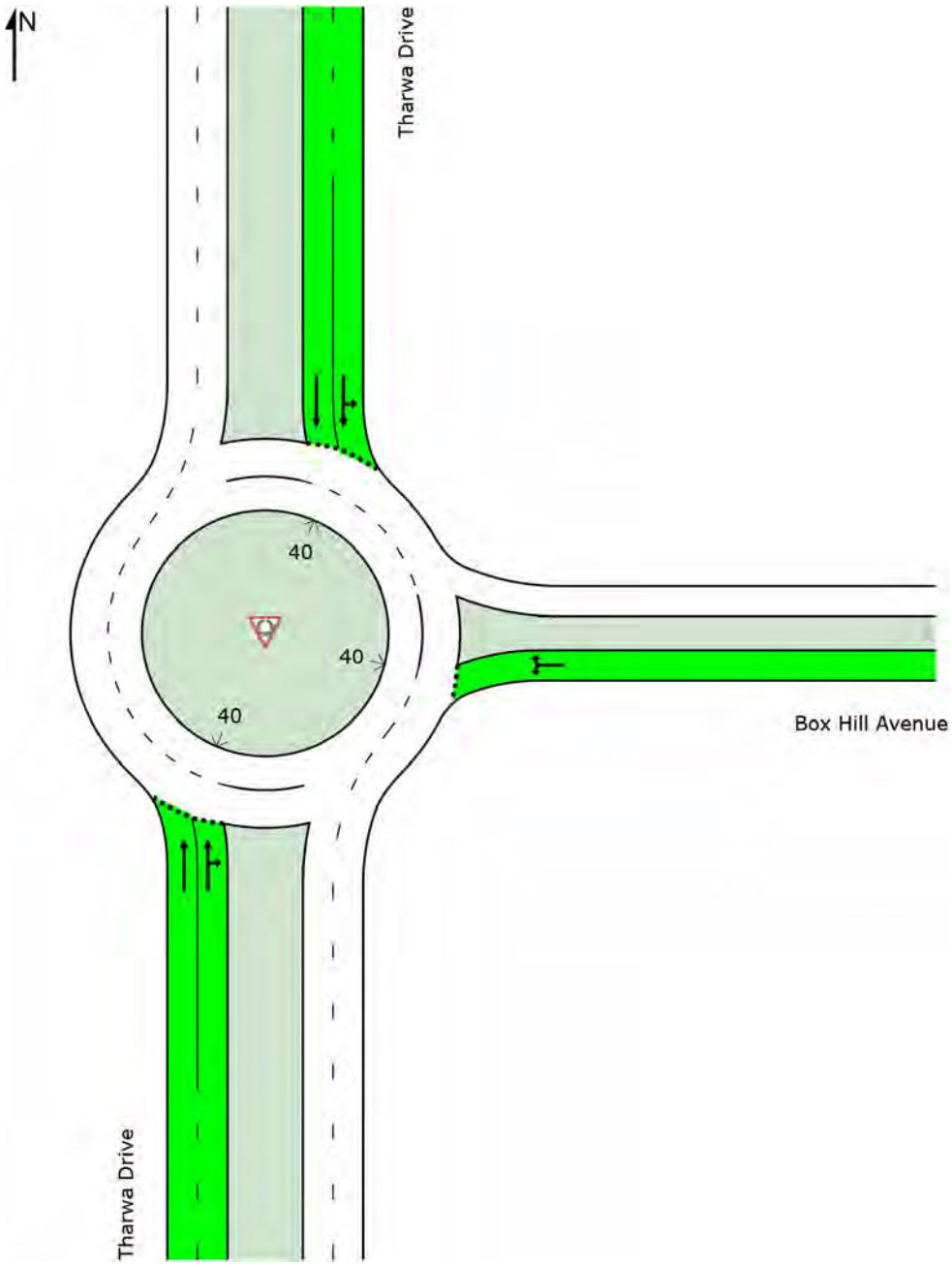
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	291	2.3	291	2.3	1088	0.268	100	5.0	LOS A	0.7	4.6	Full	990	0.0	0.0
Lane 2	248	2.3	248	2.3	925	0.268	100	6.8	LOS A	0.6	4.4	Full	990	0.0	0.0
Approach	539	2.3	539	2.3		0.268		5.8	LOS A	0.7	4.6				
East: Box Hill Avenue															
Lane 1[d]	571	2.3	571	2.3	1261	0.452	100	10.1	LOS A	1.1	7.9	Full	105	0.0	0.0
Approach	571	2.3	571	2.3		0.452		10.1	LOS A	1.1	7.9				
North: Tharwa Drive															
Lane 1[d]	186	2.3	186	2.3	1555	0.120	100	3.3	LOS A	0.2	1.8	Full	640	0.0	0.0
Lane 2	161	2.3	161	2.3	1387	0.116	97[5]	2.9	LOS A	0.2	1.7	Full	640	0.0	0.0
Approach	347	2.3	347	2.3		0.120		3.1	LOS A	0.2	1.8				
Intersection	1457	2.3	1457	2.3		0.452		6.9	LOS A	1.1	7.9				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

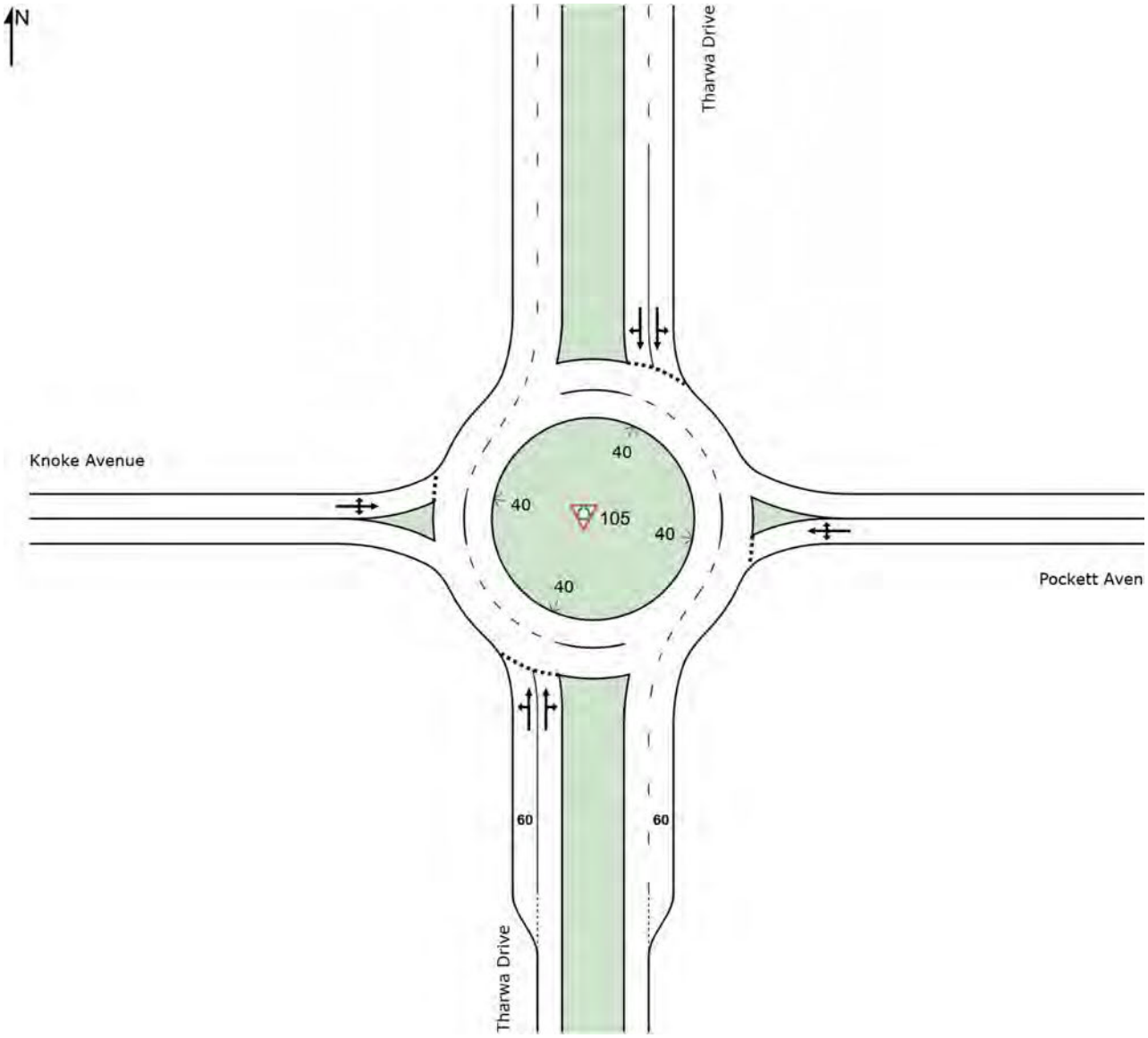
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 105 [2041_AM Peak_Tharwa Drive / Pockett Avenue - Roundabout]

Network: 10 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

Dual Lane Roundabout - Duplicated
Site Category: AM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	1	2.3	1	2.3	0.022	4.3	LOS A	0.0	0.3	0.39	0.39	0.39	52.8
2	T1	51	2.3	51	2.3	0.022	3.9	LOS A	0.0	0.3	0.40	0.41	0.40	51.3
3	R2	1	2.3	1	2.3	0.022	10.7	LOS A	0.0	0.3	0.41	0.42	0.41	50.0
Approach		53	2.3	53	2.3	0.022	4.0	LOS A	0.0	0.3	0.40	0.41	0.40	51.3
East: Pockett Avenue														
4	L2	2	2.3	2	2.3	0.237	3.0	LOS A	0.4	3.2	0.23	0.60	0.23	48.9
5	T1	27	2.3	27	2.3	0.237	2.8	LOS A	0.4	3.2	0.23	0.60	0.23	14.9
6	R2	281	2.3	281	2.3	0.237	9.4	LOS A	0.4	3.2	0.23	0.60	0.23	31.0
Approach		311	2.3	311	2.3	0.237	8.7	LOS A	0.4	3.2	0.23	0.60	0.23	27.5
North: Tharwa Drive														
7	L2	74	2.3	74	2.3	0.054	3.3	LOS A	0.1	0.7	0.12	0.38	0.12	55.9
8	T1	36	2.3	36	2.3	0.061	2.8	LOS A	0.1	0.8	0.12	0.52	0.12	57.1
9	R2	59	2.3	59	2.3	0.061	9.5	LOS A	0.1	0.8	0.12	0.52	0.12	44.5
Approach		168	2.3	168	2.3	0.061	5.4	LOS A	0.1	0.8	0.12	0.46	0.12	51.7
West: Knoke Avenue														
10	L2	199	2.3	199	2.3	0.218	4.3	LOS A	0.4	2.9	0.43	0.53	0.43	35.3
11	T1	31	2.3	31	2.3	0.218	4.0	LOS A	0.4	2.9	0.43	0.53	0.43	27.9
12	R2	3	2.3	3	2.3	0.218	10.8	LOS A	0.4	2.9	0.43	0.53	0.43	57.6
Approach		233	2.3	233	2.3	0.218	4.3	LOS A	0.4	2.9	0.43	0.53	0.43	34.3
All Vehicles		764	2.3	764	2.3	0.237	6.3	LOS A	0.4	3.2	0.28	0.53	0.28	43.0

[redacted]

Lane Use and Performance

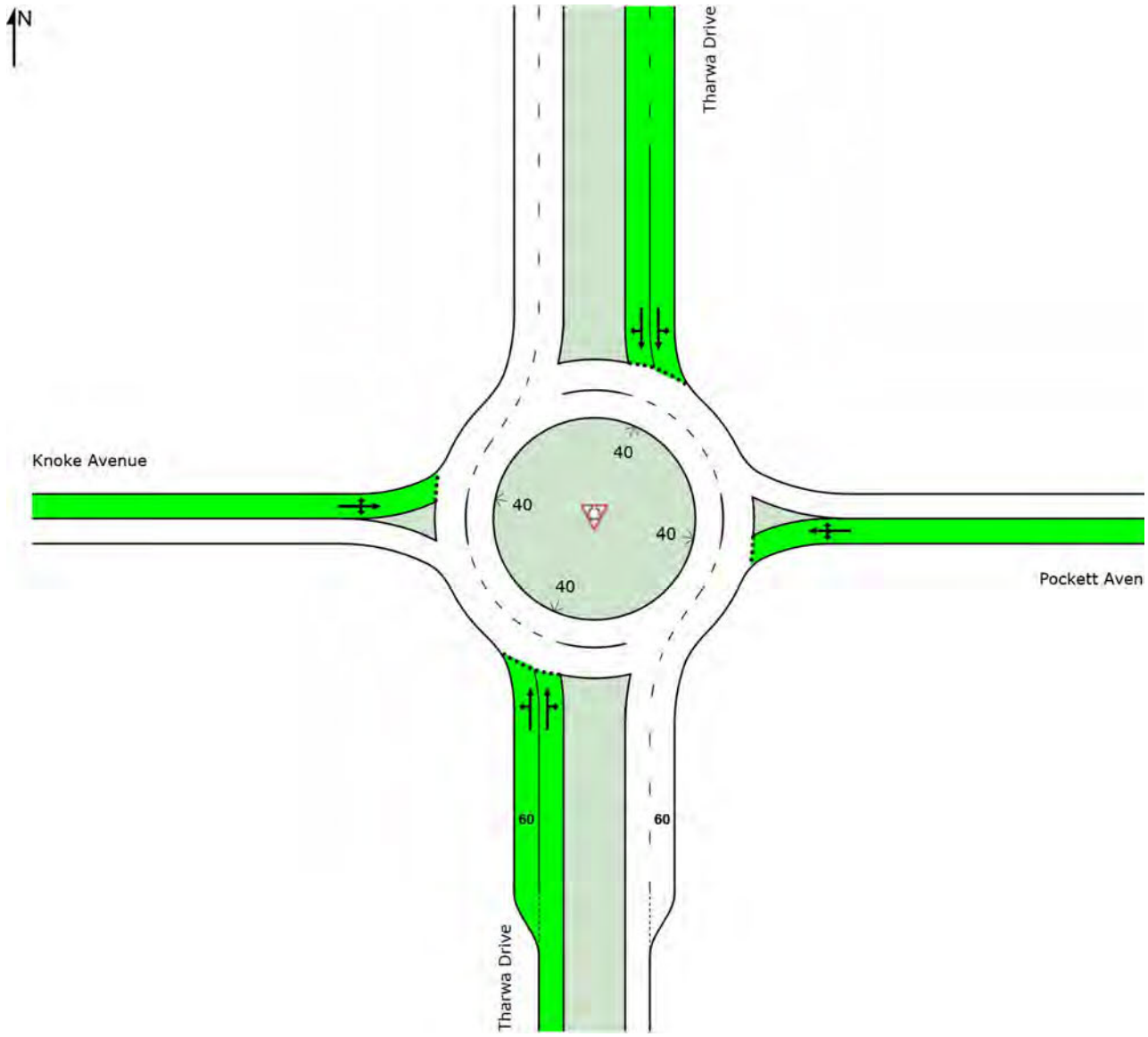
	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	Aver. Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Tharwa Drive															
Lane 1[d]	28	2.3	28	2.3	1250	0.022	100	3.8	LOS A	0.0	0.3	Short	60	0.0	NA
Lane 2	25	2.3	25	2.3	1098	0.022	100	4.3	LOS A	0.0	0.3	Full	500	0.0	0.0
Approach	53	2.3	53	2.3		0.022		4.0	LOS A	0.0	0.3				
East: Pockett Avenue															
Lane 1[d]	311	2.3	311	2.3	1312	0.237	100	8.7	LOS A	0.4	3.2	Full	80	0.0	0.0
Approach	311	2.3	311	2.3		0.237		8.7	LOS A	0.4	3.2				
North: Tharwa Drive															
Lane 1	74	2.3	74	2.3	1375	0.054	88[5]	3.3	LOS A	0.1	0.7	Full	990	0.0	0.0
Lane 2[d]	95	2.3	95	2.3	1557	0.061	100	7.0	LOS A	0.1	0.8	Full	990	0.0	0.0
Approach	168	2.3	168	2.3		0.061		5.4	LOS A	0.1	0.8				
West: Knoke Avenue															
Lane 1[d]	233	2.3	233	2.3	1067	0.218	100	4.3	LOS A	0.4	2.9	Full	95	0.0	0.0
Approach	233	2.3	233	2.3		0.218		4.3	LOS A	0.4	2.9				
Intersection	764	2.3	764	2.3		0.237		6.3	LOS A	0.4	3.2				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

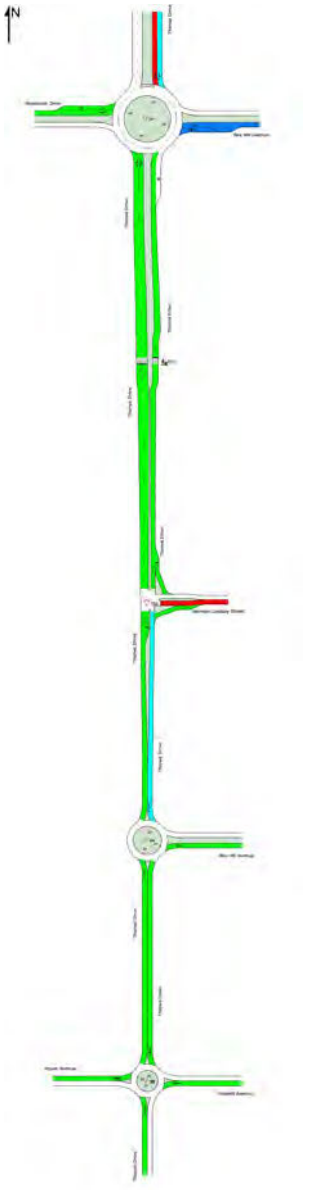
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions_Tharwa Drive PM peak - Base]

2041 Future PM Peak Conditions - Existing Layout
Network Category: (None)



Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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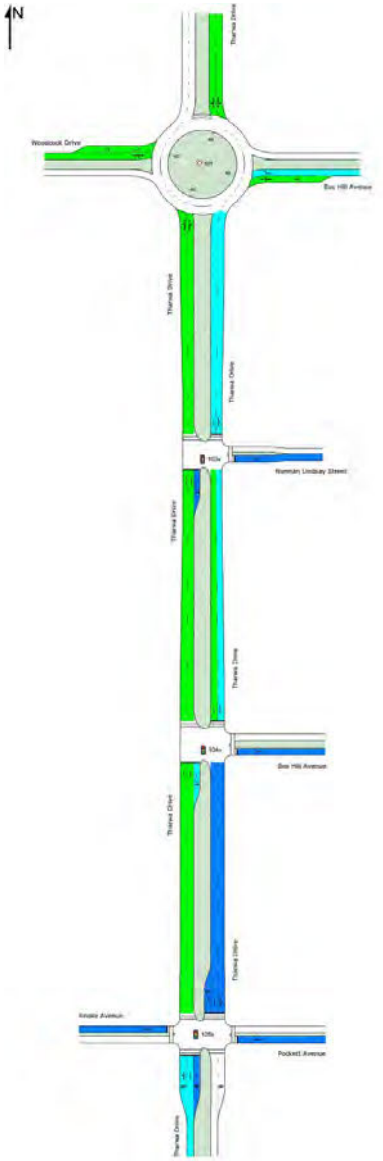
LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

2041 Future Conditions - Upgraded Layout (Op2)
Network Category: (None)
Network Cycle Time = 75 seconds (Network User-Given Cycle Time)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

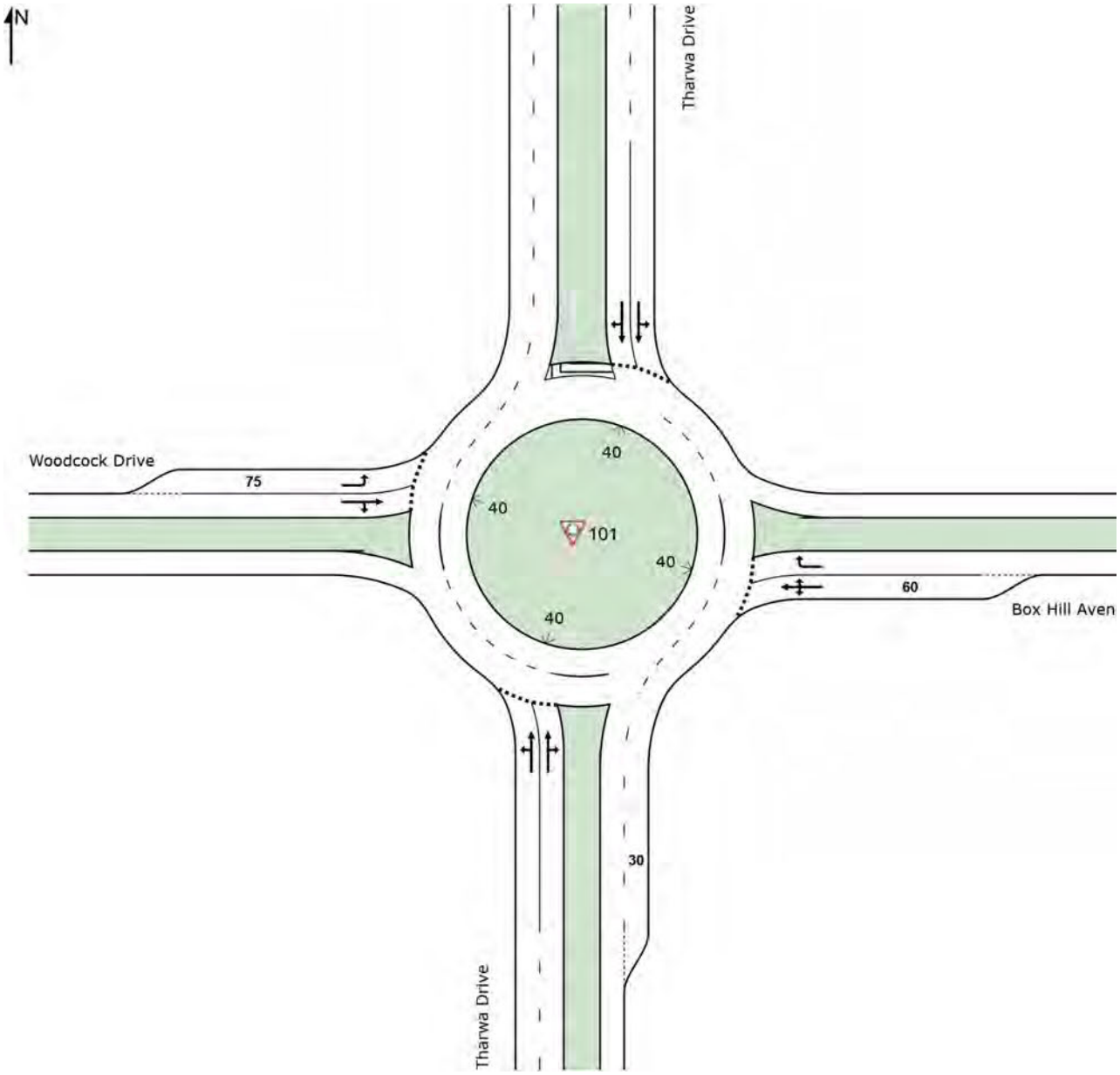
Template: Default Site User Report (2)

Site: 101 [2041_PM Peak_Tharwa Drive / Woodcock Drive - Base]

Network: 2 [2041 Future Conditions_Tharwa Drive PM peak - Base]

Two Lane Roundabout - Existing Layout
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	154	1.5	145	1.5	0.298	4.7	LOS A	0.7	4.7	0.66	0.59	0.66	49.8
2	T1	408	1.5	386	1.5	0.298	4.8	LOS A	0.7	4.7	0.66	0.58	0.66	54.3
3	R2	9	1.5	9	1.5	0.298	11.2	LOS A	0.6	4.4	0.66	0.58	0.66	40.4
Approach		572	1.5	540[N1]	1.5	0.298	4.9	LOS A	0.7	4.7	0.66	0.58	0.66	53.0
East: Box Hill Avenue														
4	L2	33	1.5	33	1.5	0.782	32.7	LOS C	4.6	32.5	1.00	1.31	1.78	16.2
5	T1	108	1.5	108	1.5	0.782	32.6	LOS C	4.6	32.5	1.00	1.31	1.78	31.0
6	R2	501	1.5	501	1.5	0.782	40.6	LOS C	4.6	32.5	1.00	1.29	1.77	32.9
Approach		642	1.5	642	1.5	0.782	38.8	LOS C	4.6	32.5	1.00	1.30	1.77	32.0
North: Tharwa Drive														
7	L2	814	1.5	814	1.5	0.655	4.9	LOS A	2.6	18.8	0.70	0.61	0.71	51.9
8	T1	993	1.5	993	1.5	1.064	72.6	LOS F	28.1	199.5	1.00	2.36	3.73	18.6
9	R2	116	1.5	116	1.5	1.064	79.5	LOS F	28.1	199.5	1.00	2.36	3.73	26.6
Approach		1922	1.5	1922	1.5	1.064	44.4	LOS D	28.1	199.5	0.87	1.62	2.45	27.2
West: Woodcock Drive														
10	L2	67	1.5	67	1.5	0.097	6.1	LOS A	0.2	1.2	0.61	0.72	0.61	54.0
11	T1	151	1.5	151	1.5	0.252	4.5	LOS A	0.4	3.0	0.63	0.60	0.63	52.0
12	R2	68	1.5	68	1.5	0.252	11.4	LOS A	0.4	3.0	0.63	0.60	0.63	45.8
Approach		286	1.5	286	1.5	0.252	6.5	LOS A	0.4	3.0	0.62	0.63	0.62	51.5
All Vehicles		3422	1.5	3390[N1]	1.5	1.064	33.8	LOS C	28.1	199.5	0.84	1.31	1.88	31.7

[redacted]

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Use and Performance

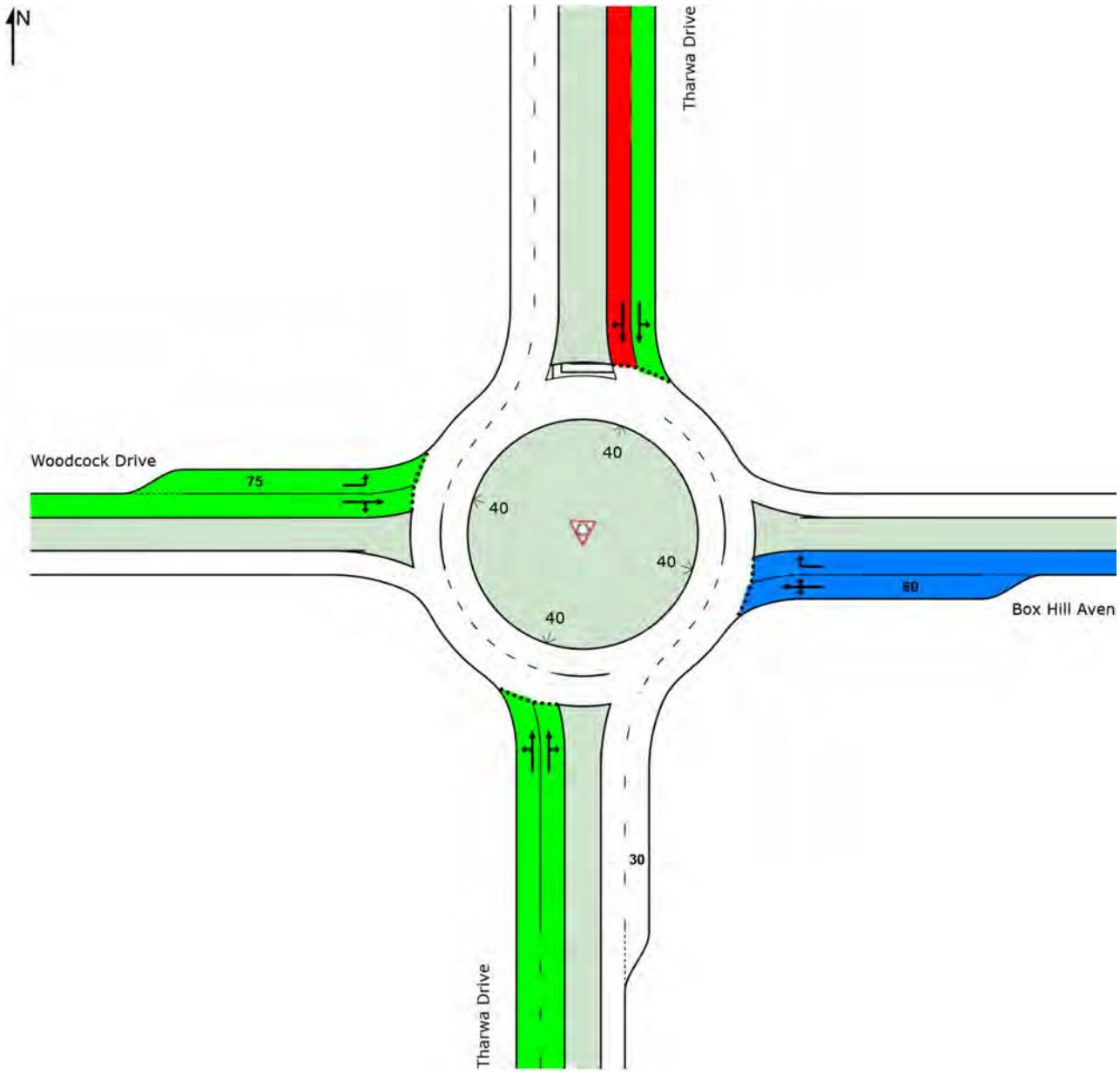
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	314	1.5	296	1.5	993	0.298	100	4.6	LOS A	0.7	4.7	Full	75	0.0	0.0
Lane 2	258	1.5	243	1.5	816	0.298	100	5.2	LOS A	0.6	4.4	Full	75	0.0	0.0
Approach	572	1.5	540[N1]	1.5		0.298		4.9	LOS A	0.7	4.7				
East: Box Hill Avenue															
Lane 1[d]	364	1.5	364	1.5	465	0.782	100	36.5	LOS C	4.6	32.5	Short	60	0.0	NA
Lane 2	279	1.5	279	1.5	356	0.782	100	41.8	LOS C	3.8	27.0	Full	150	0.0	0.0
Approach	642	1.5	642	1.5		0.782		38.8	LOS C	4.6	32.5				
North: Tharwa Drive															
Lane 1	814	1.5	814	1.5	1243	0.655	62[5]	4.9	LOS A	2.6	18.8	Full	490	0.0	0.0
Lane 2[d]	1108	1.5	1108	1.5	1042	1.064	100	73.3	LOS F	28.1	199.5	Full	490	-33.0[N3]	5.4
Approach	1922	1.5	1922	1.5		1.064		44.4	LOS D	28.1	199.5				
West: Woodcock Drive															
Lane 1	67	1.5	67	1.5	693	0.097	100	6.1	LOS A	0.2	1.2	Short	75	0.0	NA
Lane 2[d]	219	1.5	219	1.5	867	0.252	100	6.7	LOS A	0.4	3.0	Full	380	-14.7[N3]	0.0
Approach	286	1.5	286	1.5		0.252		6.5	LOS A	0.4	3.0				
Intersection	3422	1.5	3390[N1]	1.5		1.064		33.8	LOS C	28.1	199.5				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.
N3 Capacity Adjustment due to downstream lane blockage determined by the program.

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	C	D	A	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

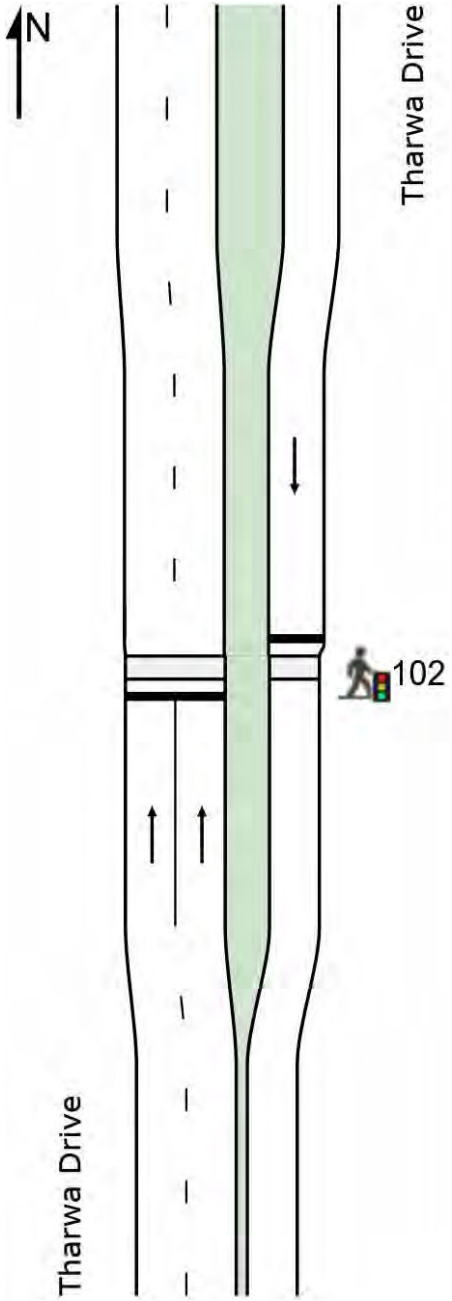
Site: 102 [2041_PM Peak_Tharwa Drive Pedestrian Crossing - Base]

Network: 2 [2041 Future Conditions_Tharwa Drive PM peak - Base]

Pedestrian Crossing - Existing Layout
Site Category: PM Peak 2041 Conditions
Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 259 seconds (Site User-Given Phase Times)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times specified by the user
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	572	1.5	540	1.5	0.139	0.4	LOS A	1.2	8.8	0.07	0.06	0.07	55.4
Approach		572	1.5	540[N1]	1.5	0.139	0.4	LOS A	1.2	8.8	0.07	0.06	0.07	55.4
North: Tharwa Drive														
8	T1	1093	1.5	1089	1.5	0.547	0.8	LOS A	9.1	64.2	0.12	0.12	0.12	51.8
Approach		1093	1.5	1089[N1]	1.5	0.547	0.8	LOS A	9.1	64.2	0.12	0.12	0.12	51.8
All Vehicles		1664	1.5	1628[N1]	1.5	0.547	0.7	LOS A	9.1	64.2	0.10	0.10	0.10	53.0

Lane Use and Performance

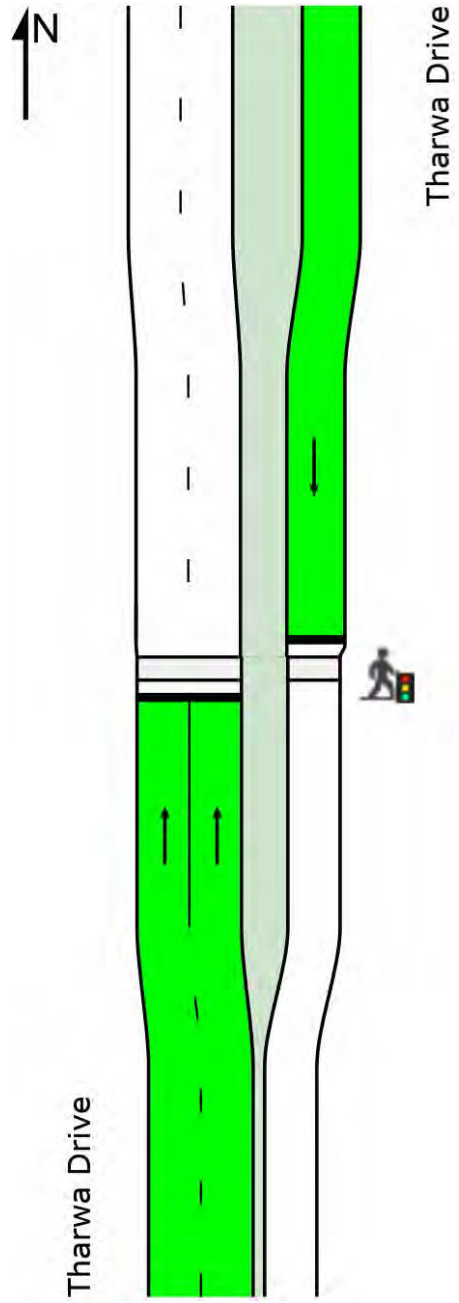
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	286	1.5	270	1.5	1941	0.139	100	0.4	LOS A	1.2	8.8	Full	80	0.0	0.0
Lane 2	286	1.5	270	1.5	1941	0.139	100	0.4	LOS A	1.2	8.8	Full	80	0.0	0.0
Approach	572	1.5	540[N1]	1.5		0.139		0.4	LOS A	1.2	8.8				
North: Tharwa Drive															
Lane 1	1093	1.5	1089	1.5	1988	0.547	100	0.8	LOS A	9.1	64.2	Full	75	0.0	35.5
Approach	1093	1.5	1089[N1]	1.5		0.547		0.8	LOS A	9.1	64.2				
Intersection	1664	1.5	1628[N1]	1.5		0.547		0.7	LOS A	9.1	64.2				

[redacted]

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Lane Level of Service

	Approaches		Intersection
	South	North	
LOS	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

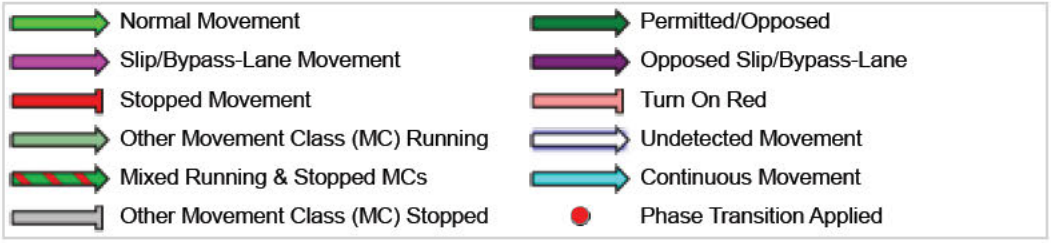
Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	248
Green Time (sec)	245	5
Phase Time (sec)	251	8
Phase Split	97%	3%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

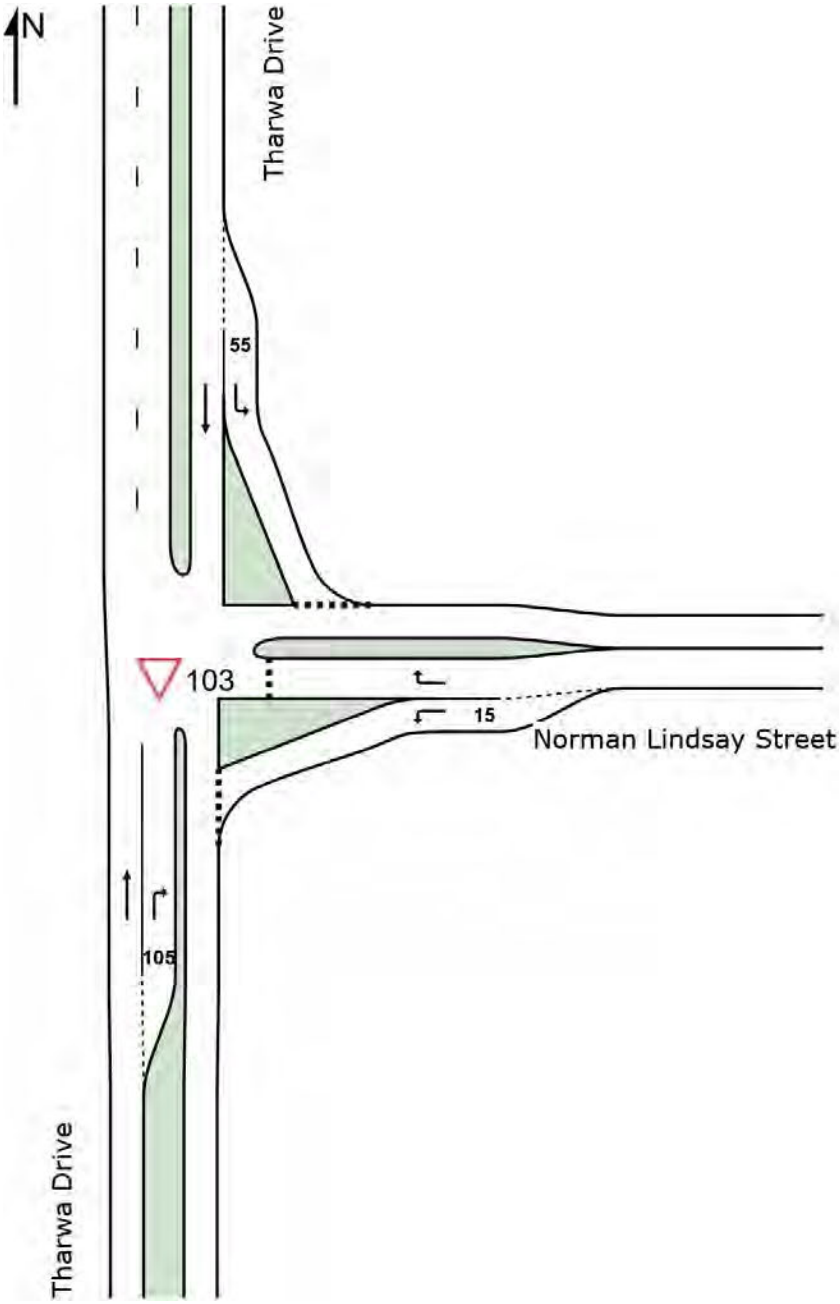


Site: 103 [2041_PM Peak_Tharwa Drive / Norman Lindsay Street - Base]

Network: 2 [2041 Future Conditions_Tharwa Drive PM peak - Base]

Priority-Controlled T-Intersection - Existing Layout
Site Category: PM Peak 2041 Conditions
Giveway / Yield (Two-Way)

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	437	1.5	437	1.5	0.228	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	109	1.5	109	1.5	0.172	10.7	LOS A	0.3	1.9	0.69	0.87	0.69	45.7
Approach		546	1.5	546	1.5	0.228	2.2	NA	0.3	1.9	0.14	0.17	0.14	56.3
East: Norman Lindsay Street														
4	L2	203	1.5	203	1.5	0.343	10.2	LOS A	0.6	4.3	0.73	0.92	0.91	16.3
6	R2	134	1.5	134	1.5	1.314	359.3	LOS F	10.3	72.7	1.00	2.52	7.50	0.5
Approach		337	1.5	337	1.5	1.314	148.7	LOS F	10.3	72.7	0.83	1.56	3.52	1.4
North: Tharwa Drive														
7	L2	247	1.5	247	1.5	0.167	5.6	LOS A	0.3	2.1	0.22	0.53	0.22	31.2
8	T1	846	1.5	846	1.5	0.438	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1094	1.5	1094	1.5	0.438	1.3	LOS A	0.3	2.1	0.05	0.12	0.05	46.6
All Vehicles		1977	1.5	1977	1.5	1.314	26.6	NA	10.3	72.7	0.21	0.38	0.67	21.1

[redacted]

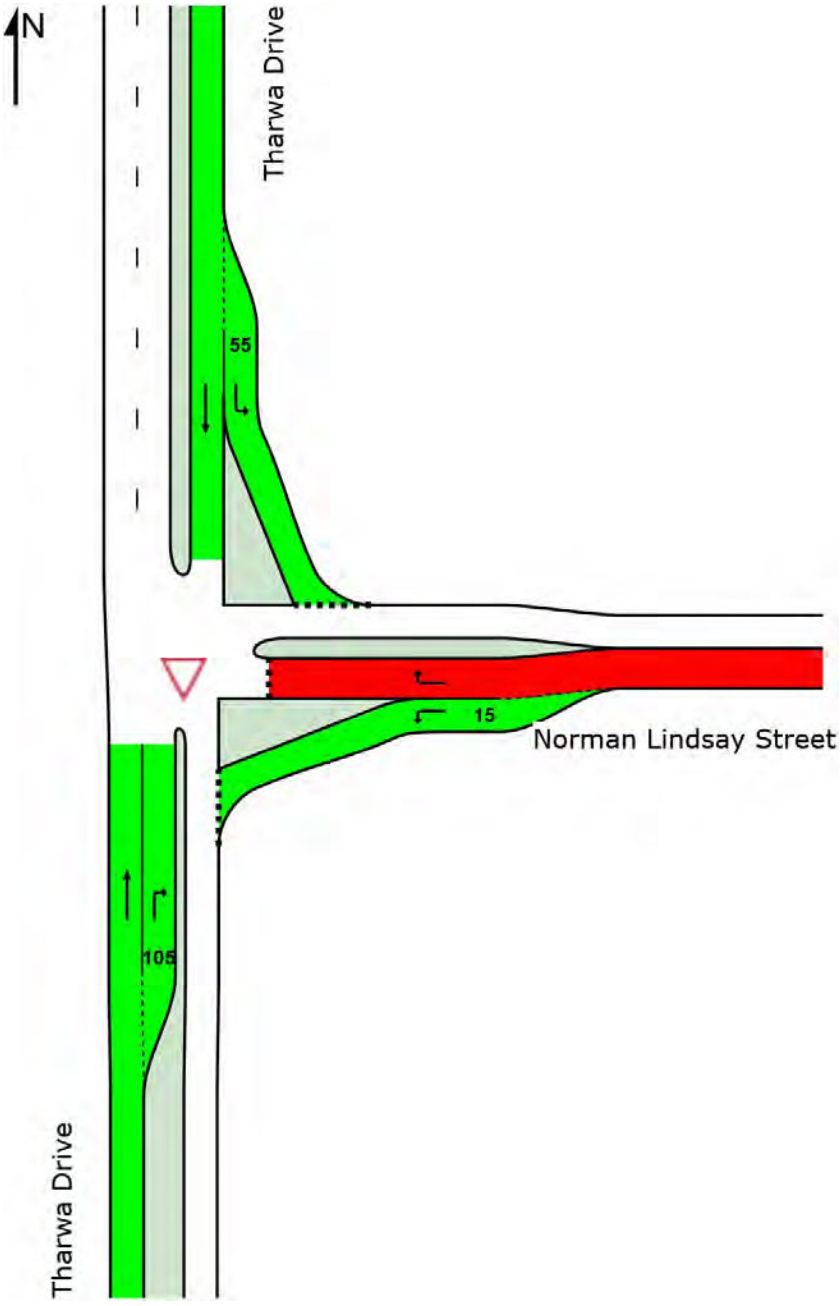
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	437	1.5	437	1.5	1916	0.228	100	0.0	LOS A	0.0	0.0	Full	640	0.0	0.0
Lane 2	109	1.5	109	1.5	636	0.172	100	10.7	LOS A	0.3	1.9	Short	105	0.0	NA
Approach	546	1.5	546	1.5		0.228		2.2	NA	0.3	1.9				
East: Norman Lindsay Street															
Lane 1	203	1.5	203	1.5	593	0.343	100	10.2	LOS A	0.6	4.3	Short	15	0.0	NA
Lane 2	134	1.5	134	1.5	102	1.314	100	359.3	LOS F	10.3	72.7	Full	40	0.0	100.0
Approach	337	1.5	337	1.5		1.314		148.7	LOS F	10.3	72.7				
North: Tharwa Drive															
Lane 1	247	1.5	247	1.5	1480	0.167	100	5.6	LOS A	0.3	2.1	Short	55	0.0	NA
Lane 2	846	1.5	846	1.5	1931	0.438	100	0.0	LOS A	0.0	0.0	Full	80	0.0	0.0
Approach	1094	1.5	1094	1.5		0.438		1.3	LOS A	0.3	2.1				
Intersection	1977	1.5	1977	1.5		1.314		26.6	NA	10.3	72.7				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	NA	F	A	NA



Colour code based on Level of Service

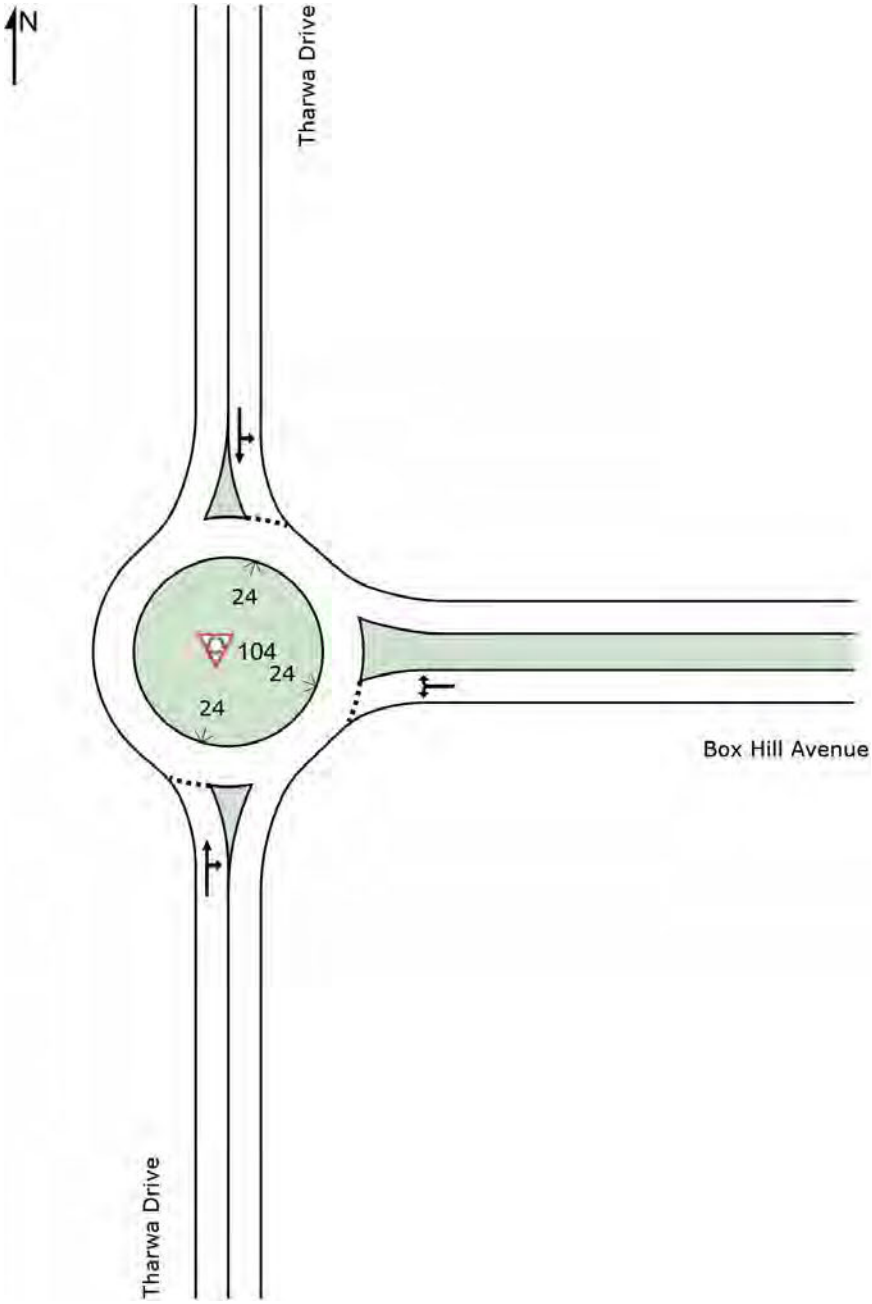
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 104 [2041_PM Peak_Tharwa Drive / Box Hill Avenue - Base]

Network: 2 [2041 Future Conditions_Tharwa Drive PM peak - Base]

Single Lane Roundabout - Existing Layout
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	286	1.5	286	1.5	0.275	5.1	LOS A	0.7	5.1	0.53	0.54	0.53	53.9
3	R2	14	1.5	14	1.5	0.275	10.4	LOS A	0.7	5.1	0.53	0.54	0.53	52.8
Approach		300	1.5	300	1.5	0.275	5.4	LOS A	0.7	5.1	0.53	0.54	0.53	53.9
East: Box Hill Avenue														
4	L2	14	1.5	14	1.5	0.305	7.2	LOS A	0.8	5.4	0.68	0.79	0.68	26.6
6	R2	262	1.5	262	1.5	0.305	12.4	LOS A	0.8	5.4	0.68	0.79	0.68	26.6
Approach		276	1.5	276	1.5	0.305	12.2	LOS A	0.8	5.4	0.68	0.79	0.68	26.6
North: Tharwa Drive														
7	L2	486	1.5	486	1.5	0.628	3.8	LOS A	3.0	21.4	0.17	0.39	0.17	53.7
8	T1	567	1.5	567	1.5	0.628	3.9	LOS A	3.0	21.4	0.17	0.39	0.17	53.8
Approach		1054	1.5	1054	1.5	0.628	3.9	LOS A	3.0	21.4	0.17	0.39	0.17	53.7
All Vehicles		1629	1.5	1629	1.5	0.628	5.6	LOS A	3.0	21.4	0.32	0.49	0.32	51.7

[redacted]

Lane Use and Performance

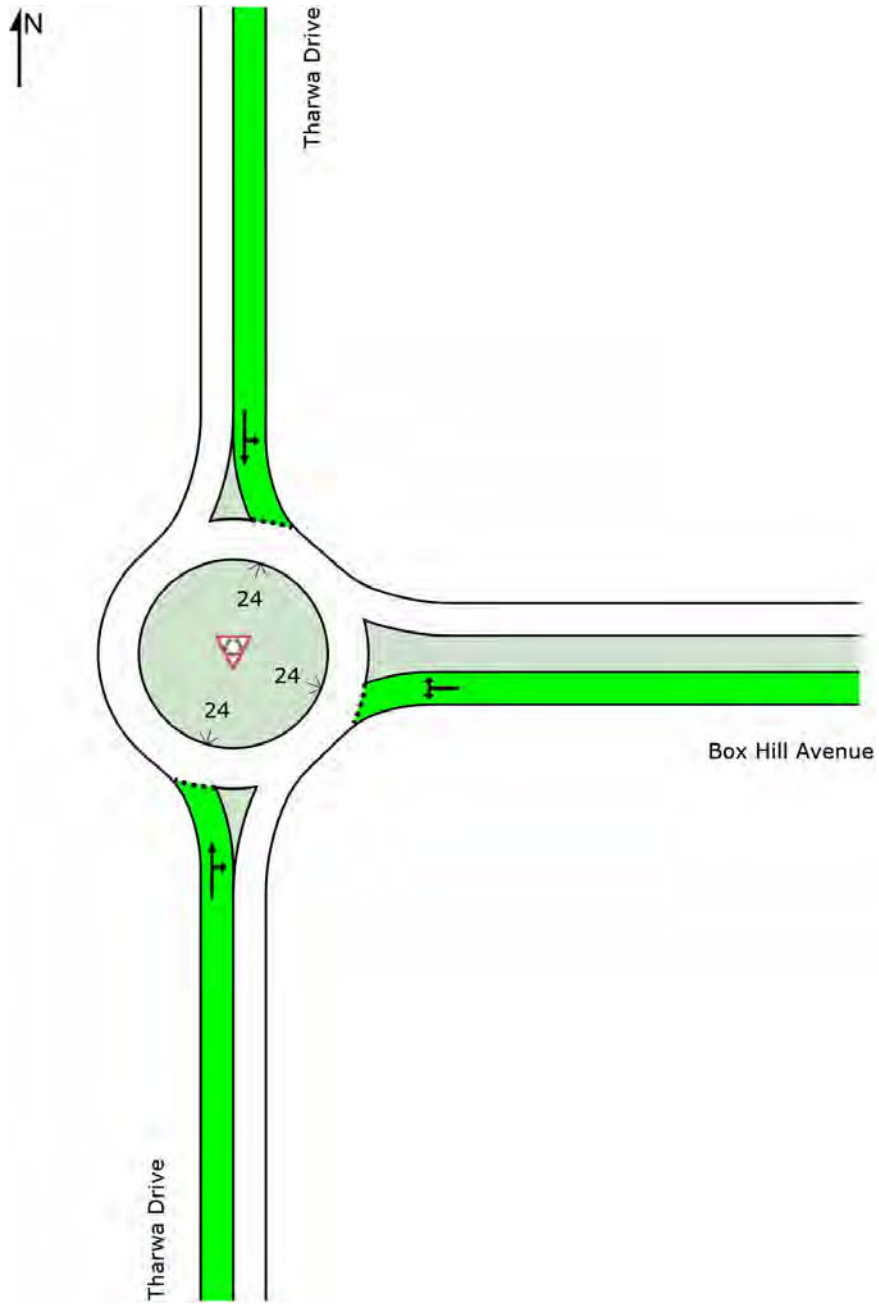
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	300	1.5	300	1.5	1092	0.275	100	5.4	LOS A	0.7	5.1	Full	990	0.0	0.0
Approach	300	1.5	300	1.5		0.275		5.4	LOS A	0.7	5.1				
East: Box Hill Avenue															
Lane 1[d]	276	1.5	276	1.5	906	0.305	100	12.2	LOS A	0.8	5.4	Full	105	0.0	0.0
Approach	276	1.5	276	1.5		0.305		12.2	LOS A	0.8	5.4				
North: Tharwa Drive															
Lane 1[d]	1054	1.5	1054	1.5	1678	0.628	100	3.9	LOS A	3.0	21.4	Full	640	0.0	0.0
Approach	1054	1.5	1054	1.5		0.628		3.9	LOS A	3.0	21.4				
Intersection	1629	1.5	1629	1.5		0.628		5.6	LOS A	3.0	21.4				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

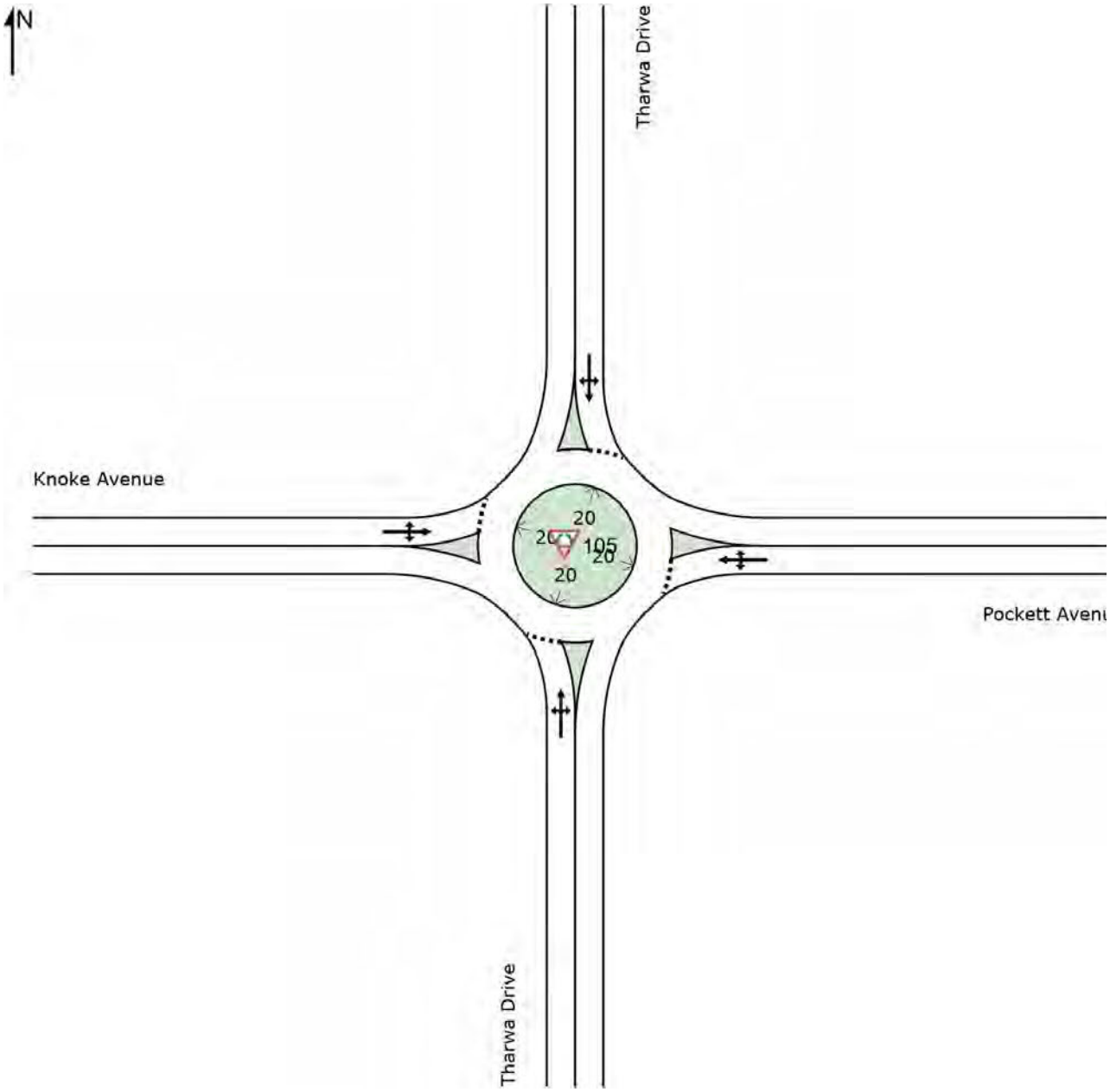
[redacted]

Site: 105 [2041_PM Peak_Tharwa Drive / Pockett Avenue - Base]

Network: 2 [2041 Future Conditions_Tharwa Drive PM peak - Base]

Single-Lane Roundabout - Existing Layout
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.039	5.8	LOS A	0.1	0.6	0.50	0.56	0.50	49.0
2	T1	31	1.5	31	1.5	0.039	6.0	LOS A	0.1	0.6	0.50	0.56	0.50	48.5
3	R2	6	1.5	6	1.5	0.039	10.6	LOS A	0.1	0.6	0.50	0.56	0.50	47.2
Approach		39	1.5	39	1.5	0.039	6.8	LOS A	0.1	0.6	0.50	0.56	0.50	48.3
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.190	4.9	LOS A	0.4	3.0	0.46	0.66	0.46	47.4
5	T1	38	1.5	38	1.5	0.190	5.1	LOS A	0.4	3.0	0.46	0.66	0.46	12.6
6	R2	161	1.5	161	1.5	0.190	9.8	LOS A	0.4	3.0	0.46	0.66	0.46	27.4
Approach		209	1.5	209	1.5	0.190	8.7	LOS A	0.4	3.0	0.46	0.66	0.46	22.9
North: Tharwa Drive														
7	L2	309	1.5	309	1.5	0.388	4.2	LOS A	1.1	8.1	0.23	0.52	0.23	45.4
8	T1	62	1.5	62	1.5	0.388	4.4	LOS A	1.1	8.1	0.23	0.52	0.23	56.4
9	R2	211	1.5	211	1.5	0.388	9.0	LOS A	1.1	8.1	0.23	0.52	0.23	45.2
Approach		582	1.5	582	1.5	0.388	5.9	LOS A	1.1	8.1	0.23	0.52	0.23	46.6
West: Knoke Avenue														
10	L2	92	1.5	92	1.5	0.115	4.8	LOS A	0.2	1.8	0.38	0.51	0.38	32.5
11	T1	37	1.5	37	1.5	0.115	5.0	LOS A	0.2	1.8	0.38	0.51	0.38	24.2
12	R2	5	1.5	5	1.5	0.115	9.7	LOS A	0.2	1.8	0.38	0.51	0.38	52.6
Approach		134	1.5	134	1.5	0.115	5.1	LOS A	0.2	1.8	0.38	0.51	0.38	30.7
All Vehicles		964	1.5	964	1.5	0.388	6.4	LOS A	1.1	8.1	0.31	0.55	0.31	43.9

[redacted]

Lane Use and Performance

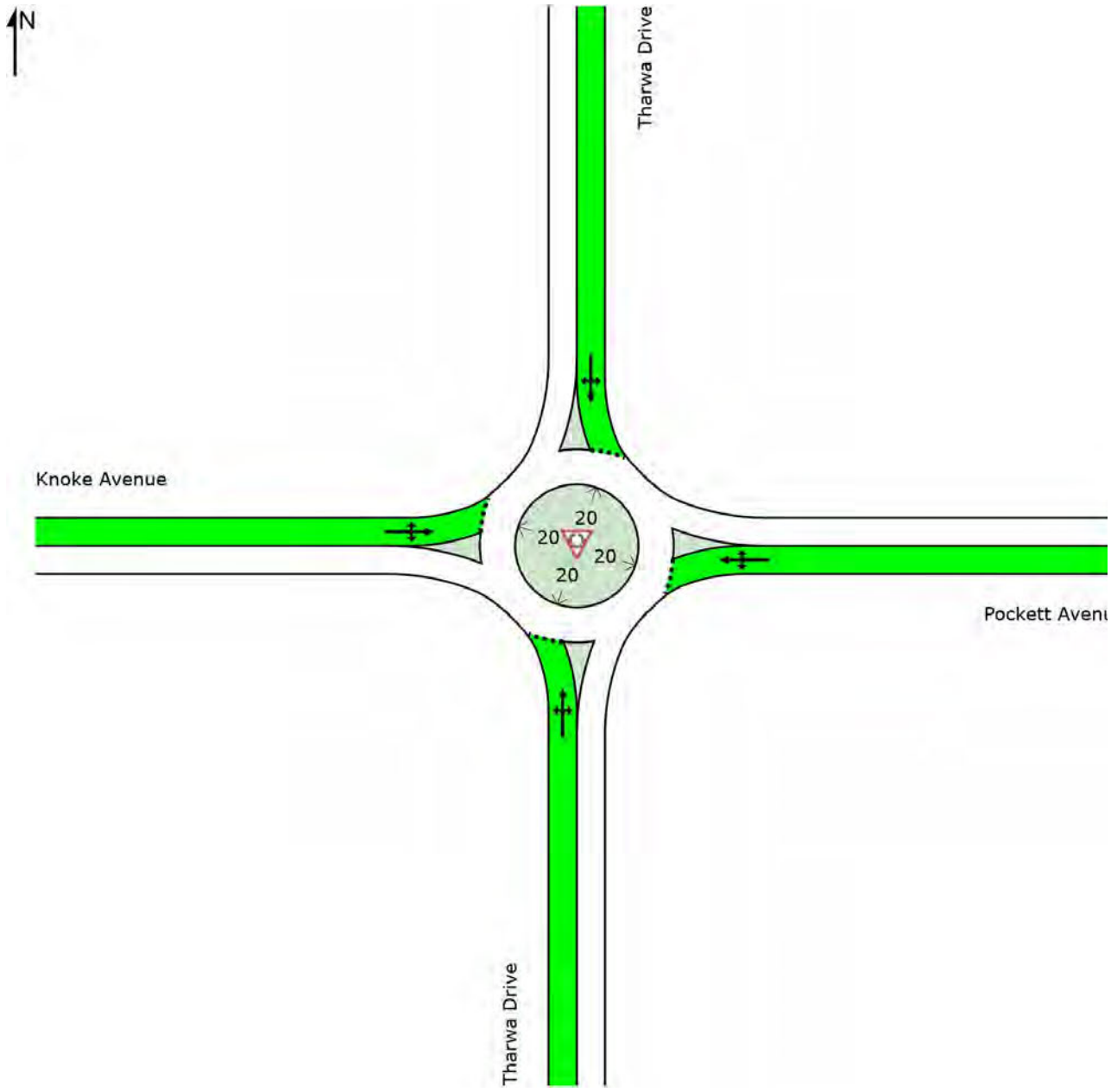
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	39	1.5	39	1.5	999	0.039	100	6.8	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	39	1.5	39	1.5		0.039		6.8	LOS A	0.1	0.6				
East: Pockett Avenue															
Lane 1[d]	209	1.5	209	1.5	1102	0.190	100	8.7	LOS A	0.4	3.0	Full	80	0.0	0.0
Approach	209	1.5	209	1.5		0.190		8.7	LOS A	0.4	3.0				
North: Tharwa Drive															
Lane 1[d]	582	1.5	582	1.5	1501	0.388	100	5.9	LOS A	1.1	8.1	Full	990	0.0	0.0
Approach	582	1.5	582	1.5		0.388		5.9	LOS A	1.1	8.1				
West: Knoke Avenue															
Lane 1[d]	134	1.5	134	1.5	1165	0.115	100	5.1	LOS A	0.2	1.8	Full	95	0.0	0.0
Approach	134	1.5	134	1.5		0.115		5.1	LOS A	0.2	1.8				
Intersection	964	1.5	964	1.5		0.388		6.4	LOS A	1.1	8.1				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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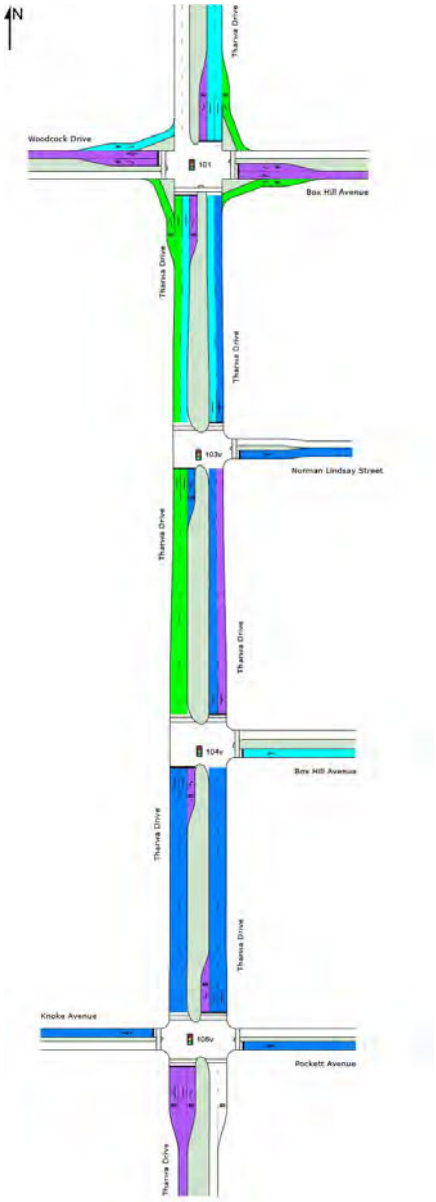
LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op3]

2041 Future Conditions - Upgraded Layout Option 3
Network Category: (None)
Network Cycle Time = 90 seconds (Network User-Given Cycle Time)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

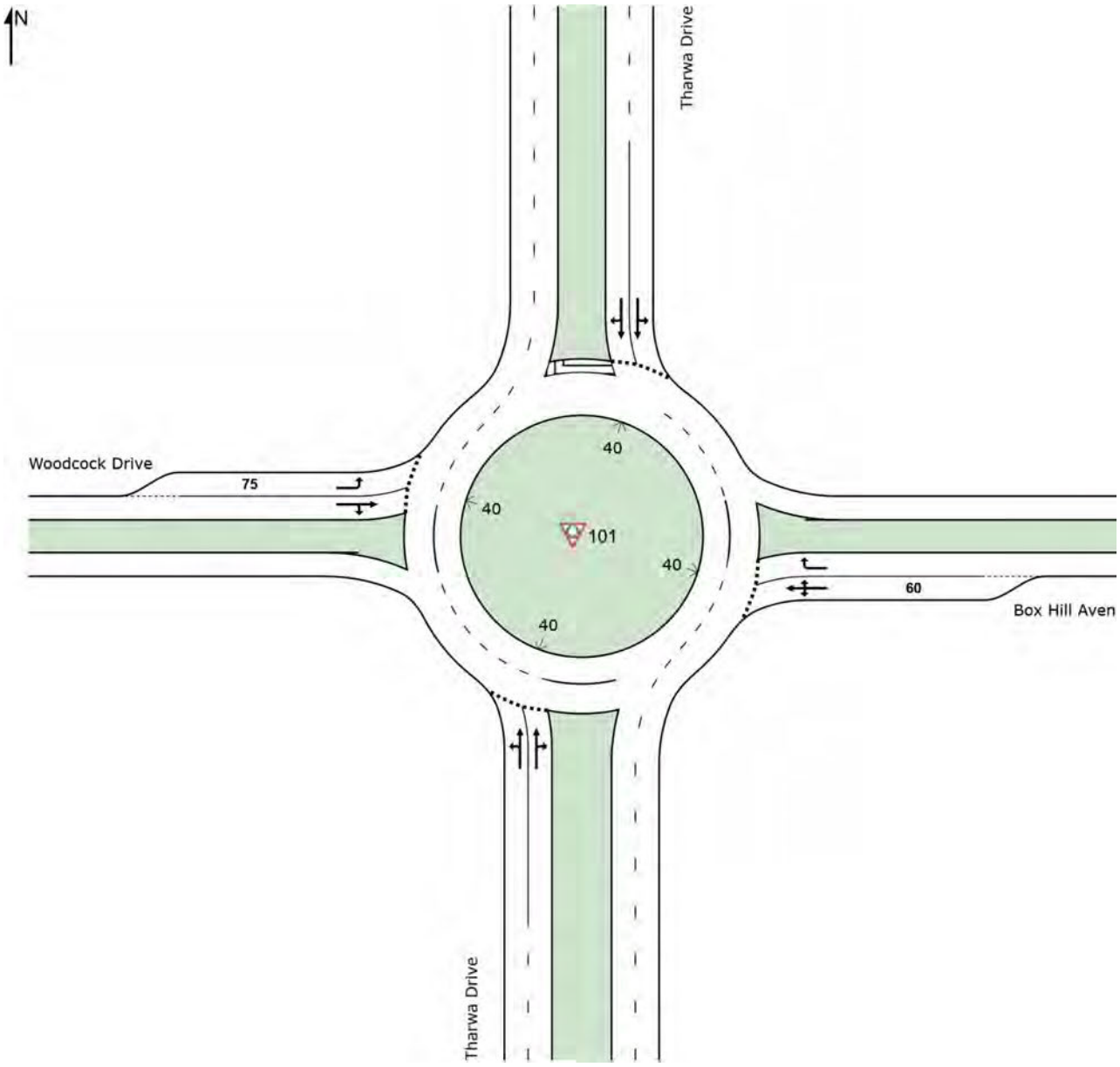
Template: Default Site User Report (2)

Site: 101 [2041_PM Peak_Tharwa Drive / Woodcock Drive - Duplicated]

Network: 5 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

Two Lane Roundabout - Duplicated
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	154	1.5	154	1.5	0.310	5.3	LOS A	0.6	4.1	0.53	0.57	0.53	50.8
2	T1	408	1.5	408	1.5	0.310	5.3	LOS A	0.6	4.1	0.54	0.56	0.54	54.7
3	R2	9	1.5	9	1.5	0.310	11.9	LOS A	0.5	3.8	0.55	0.56	0.55	43.6
Approach		572	1.5	572	1.5	0.310	5.4	LOS A	0.6	4.1	0.54	0.56	0.54	53.6
East: Box Hill Avenue														
4	L2	33	1.5	33	1.5	0.471	8.3	LOS A	1.4	9.8	0.87	0.96	1.00	31.2
5	T1	108	1.5	108	1.5	0.471	8.2	LOS A	1.4	9.8	0.87	0.96	1.00	47.3
6	R2	501	1.5	501	1.5	0.471	15.4	LOS B	1.4	9.8	0.86	0.98	1.01	48.0
Approach		642	1.5	642	1.5	0.471	13.8	LOS A	1.4	9.8	0.86	0.98	1.01	47.5
North: Tharwa Drive														
7	L2	814	1.5	814	1.5	0.685	4.5	LOS A	3.0	21.2	0.68	0.53	0.68	51.9
8	T1	993	1.5	993	1.5	0.685	4.6	LOS A	3.0	21.4	0.72	0.54	0.73	48.5
9	R2	116	1.5	116	1.5	0.685	11.7	LOS A	3.0	21.4	0.73	0.55	0.75	55.5
Approach		1922	1.5	1922	1.5	0.685	5.0	LOS A	3.0	21.4	0.70	0.54	0.71	50.6
West: Woodcock Drive														
10	L2	67	1.5	67	1.5	0.094	6.1	LOS A	0.2	1.1	0.61	0.71	0.61	54.1
11	T1	151	1.5	151	1.5	0.210	4.5	LOS A	0.4	3.0	0.62	0.60	0.62	52.0
12	R2	68	1.5	68	1.5	0.210	11.5	LOS A	0.4	3.0	0.62	0.60	0.62	45.8
Approach		286	1.5	286	1.5	0.210	6.6	LOS A	0.4	3.0	0.62	0.62	0.62	51.5
All Vehicles		3422	1.5	3422	1.5	0.685	6.8	LOS A	3.0	21.4	0.70	0.63	0.73	50.5

[redacted]

Lane Use and Performance

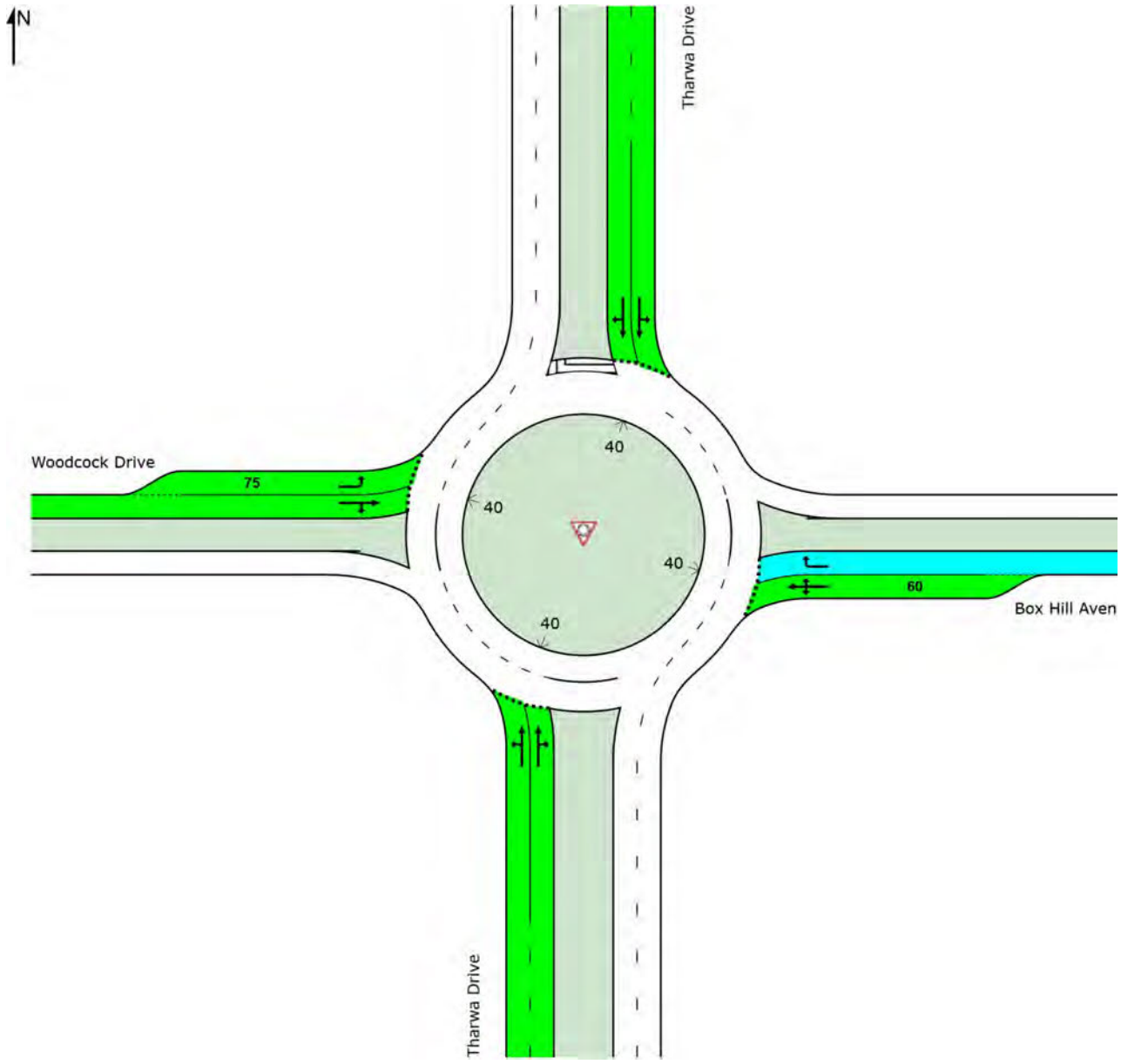
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	314	1.5	314	1.5	1014	0.310	100	5.1	LOS A	0.6	4.1	Full	165	0.0	0.0
Lane 2	258	1.5	258	1.5	832	0.310	100	5.7	LOS A	0.5	3.8	Full	165	0.0	0.0
Approach	572	1.5	572	1.5		0.310		5.4	LOS A	0.6	4.1				
East: Box Hill Avenue															
Lane 1[d]	367	1.5	367	1.5	779	0.471	100	12.1	LOS A	1.4	9.8	Short	60	0.0	NA
Lane 2	275	1.5	275	1.5	585	0.471	100	16.1	LOS B	1.2	8.8	Full	150	0.0	0.0
Approach	642	1.5	642	1.5		0.471		13.8	LOS A	1.4	9.8				
North: Tharwa Drive															
Lane 1[d]	1065	1.5	1065	1.5	1556	0.685	100	4.4	LOS A	3.0	21.2	Full	490	0.0	0.0
Lane 2	857	1.5	857	1.5	1251	0.685	100	5.7	LOS A	3.0	21.4	Full	490	0.0	0.0
Approach	1922	1.5	1922	1.5		0.685		5.0	LOS A	3.0	21.4				
West: Woodcock Drive															
Lane 1	67	1.5	67	1.5	717	0.094	100	6.1	LOS A	0.2	1.1	Short	75	0.0	NA
Lane 2[d]	219	1.5	219	1.5	1043	0.210	100	6.7	LOS A	0.4	3.0	Full	380	0.0	0.0
Approach	286	1.5	286	1.5		0.210		6.6	LOS A	0.4	3.0				
Intersection	3422	1.5	3422	1.5		0.685		6.8	LOS A	3.0	21.4				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

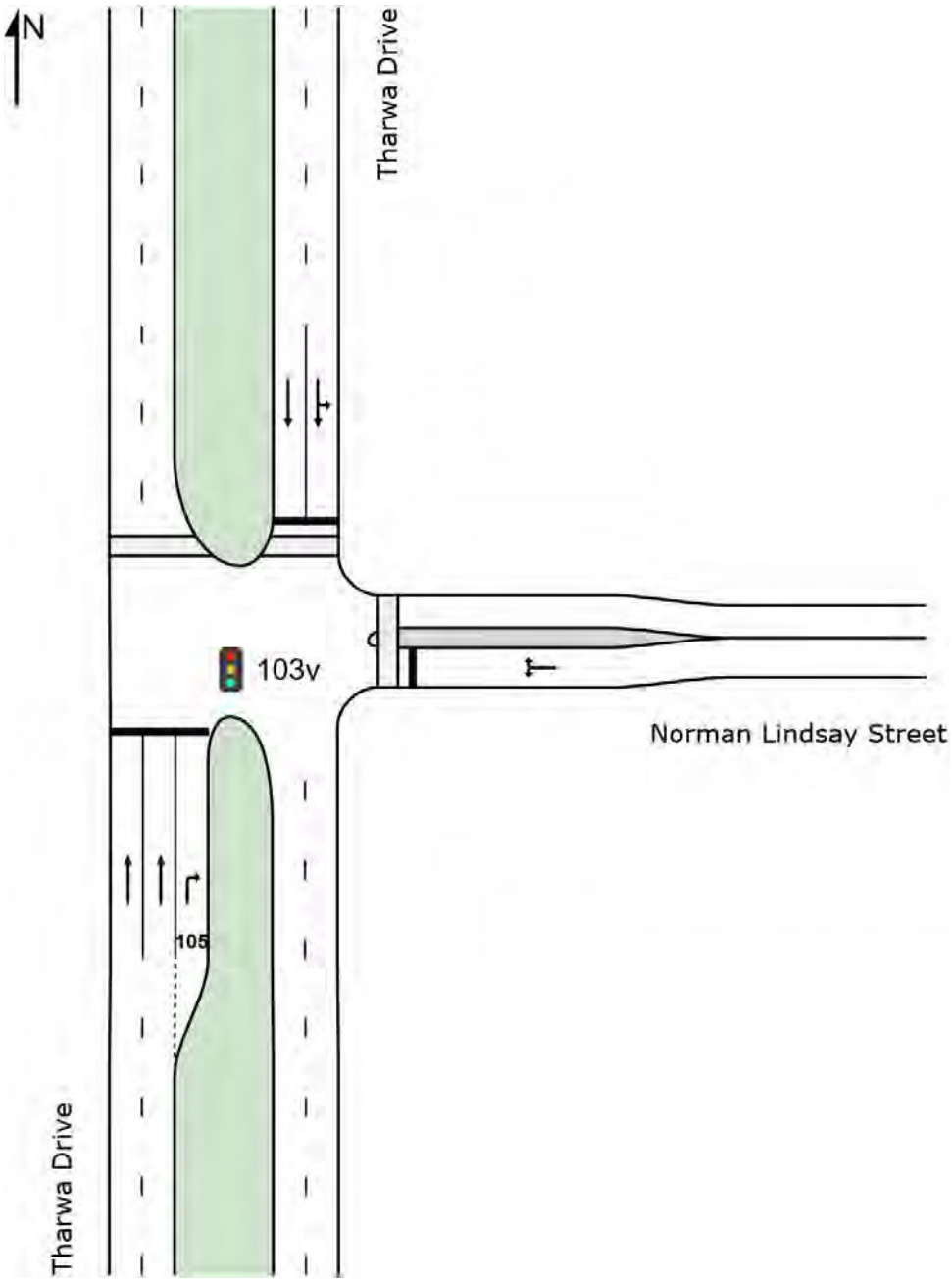
Site: 103v [2041_PM Peak_Tharwa Drive / Norman Lindsay Street - Upgraded]

Network: 5 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

Signalised T-Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Isolated Cycle Time = 75 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	437	1.5	437	1.5	0.189	7.2	LOS A	2.2	15.5	0.48	0.40	0.48	50.6
3	R2	109	1.5	109	1.5	0.638	44.1	LOS D	2.6	18.3	1.00	0.82	1.11	28.4
Approach		546	1.5	546	1.5	0.638	14.6	LOS B	2.6	18.3	0.58	0.49	0.60	43.5
East: Norman Lindsay Street														
4	L2	203	1.5	203	1.5	0.737	34.4	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
6	R2	134	1.5	134	1.5	0.737	34.3	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
Approach		337	1.5	337	1.5	0.737	34.4	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
North: Tharwa Drive														
7	L2	247	1.5	247	1.5	0.671	24.3	LOS B	9.8	69.7	0.86	0.80	0.86	10.5
8	T1	846	1.5	846	1.5	0.671	18.8	LOS B	10.0	71.2	0.86	0.77	0.86	21.0
Approach		1094	1.5	1094	1.5	0.671	20.0	LOS B	10.0	71.2	0.86	0.78	0.86	16.6
All Vehicles		1977	1.5	1977	1.5	0.737	21.0	LOS B	10.0	71.2	0.81	0.72	0.83	24.2

[redacted]

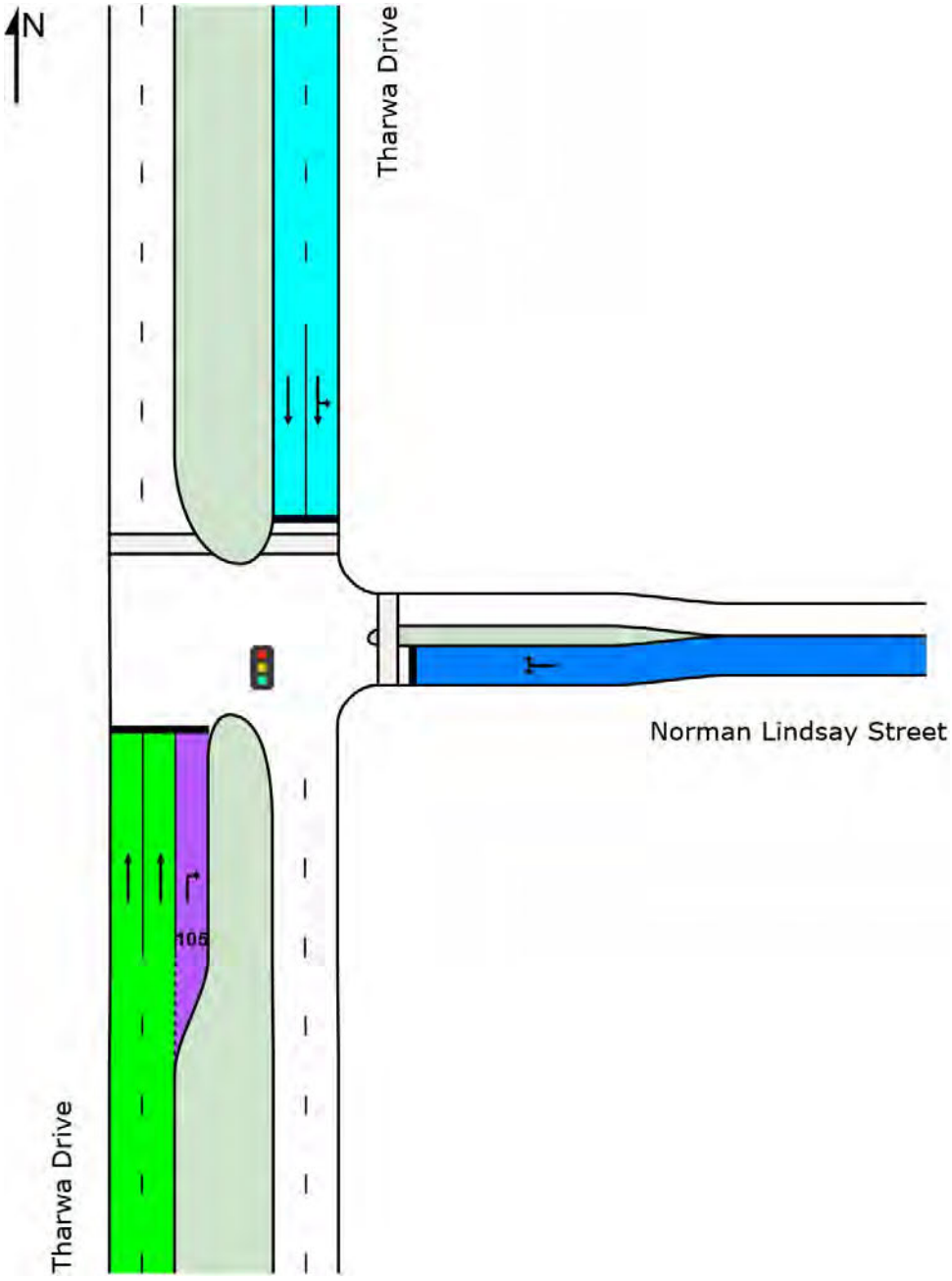
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	218	1.5	218	1.5	1159	0.189	100	7.2	LOS A	2.2	15.5	Full	640	0.0	0.0
Lane 2	218	1.5	218	1.5	1159	0.189	100	7.2	LOS A	2.2	15.5	Full	640	0.0	0.0
Lane 3	109	1.5	109	1.5	171	0.638	100	44.1	LOS D	2.6	18.3	Short	105	0.0	NA
Approach	546	1.5	546	1.5		0.638		14.6	LOS B	2.6	18.3				
East: Norman Lindsay Street															
Lane 1	337	1.5	337	1.5	457	0.737	100	34.4	LOS C	7.5	53.1	Full	40	0.0	77.1
Approach	337	1.5	337	1.5		0.737		34.4	LOS C	7.5	53.1				
North: Tharwa Drive															
Lane 1	541	1.5	541	1.5	805	0.671	100	21.3	LOS B	9.8	69.7	Full	165	0.0	0.0
Lane 2	553	1.5	553	1.5	824	0.671	100	18.7	LOS B	10.0	71.2	Full	165	0.0	0.0
Approach	1094	1.5	1094	1.5		0.671		20.0	LOS B	10.0	71.2				
Intersection	1977	1.5	1977	1.5		0.737		21.0	LOS B	10.0	71.2				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	B	C	B	B



Colour code based on Level of Service

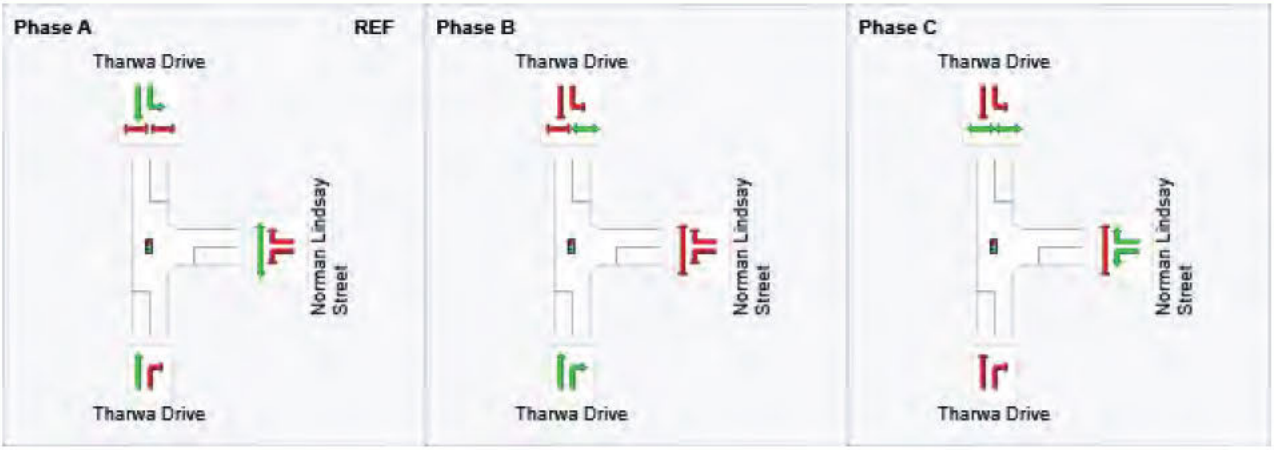
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

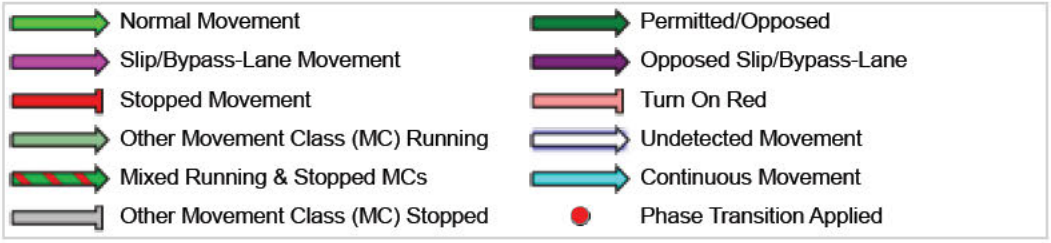
Phase	A	B	C
Phase Change Time (sec)	0	38	51
Green Time (sec)	32	7	18
Phase Time (sec)	38	13	24
Phase Split	51%	17%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

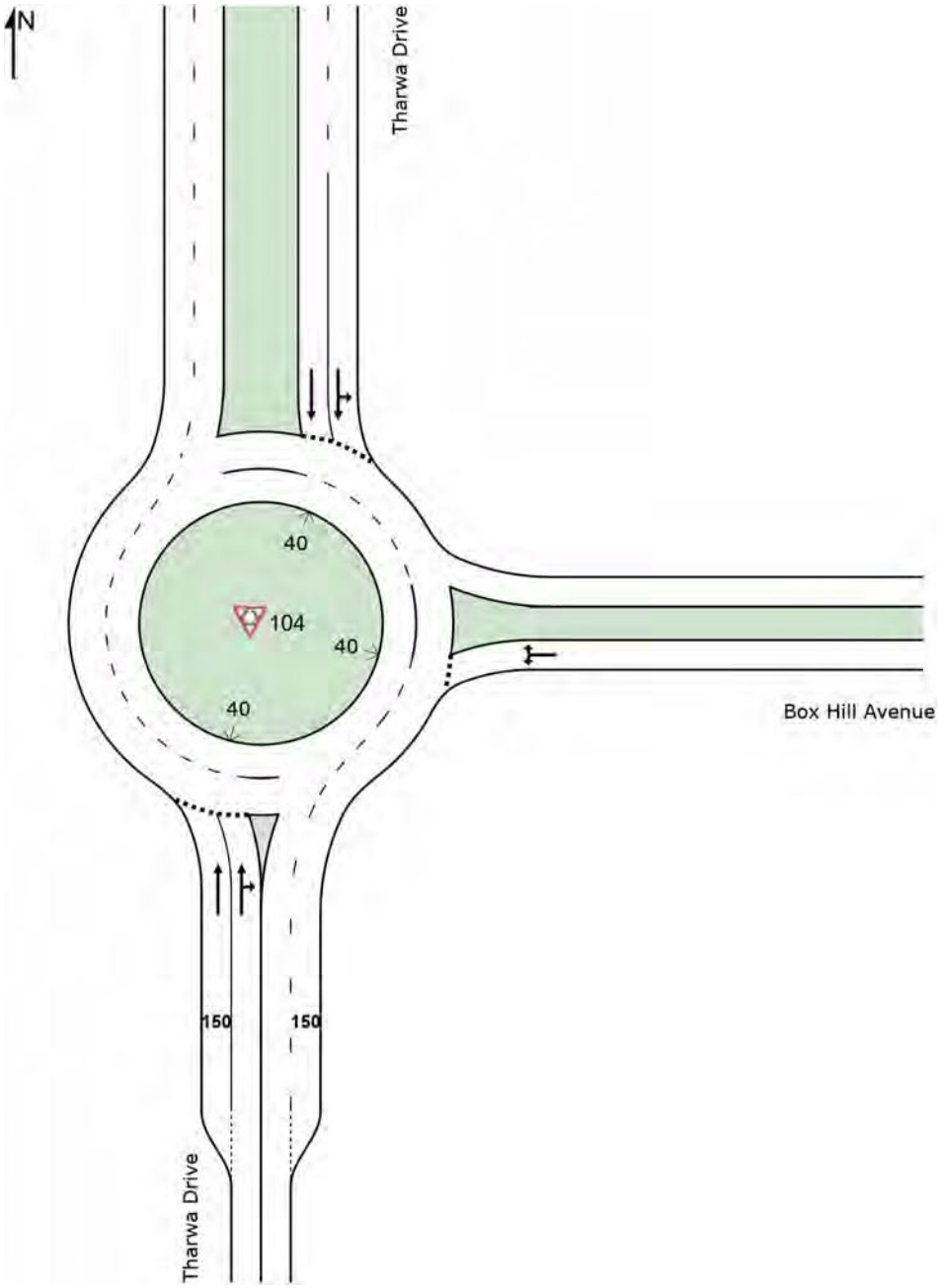


Site: 104 [2041_PM Peak_Tharwa Drive / Box Hill Avenue - Roundabout to single lane]

Network: 5 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

Dual Lane Roundabout - Duplicated to north, return to single carriageway to south
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	286	1.5	286	1.5	0.122	3.6	LOS A	0.2	1.8	0.39	0.39	0.39	55.0
3	R2	14	1.5	14	1.5	0.122	10.4	LOS A	0.2	1.7	0.40	0.42	0.40	54.0
Approach		300	1.5	300	1.5	0.122	3.9	LOS A	0.2	1.8	0.39	0.39	0.39	55.0
East: Box Hill Avenue														
4	L2	14	1.5	14	1.5	0.278	5.5	LOS A	0.6	4.3	0.55	0.73	0.55	29.6
6	R2	262	1.5	262	1.5	0.278	11.9	LOS A	0.6	4.3	0.55	0.73	0.55	29.6
Approach		276	1.5	276	1.5	0.278	11.6	LOS A	0.6	4.3	0.55	0.73	0.55	29.6
North: Tharwa Drive														
7	L2	486	1.5	486	1.5	0.324	3.2	LOS A	0.7	4.9	0.07	0.37	0.07	56.0
8	T1	567	1.5	567	1.5	0.324	2.8	LOS A	0.7	4.9	0.07	0.29	0.07	55.6
Approach		1054	1.5	1054	1.5	0.324	3.0	LOS A	0.7	4.9	0.07	0.33	0.07	55.8
All Vehicles		1629	1.5	1629	1.5	0.324	4.6	LOS A	0.7	4.9	0.21	0.41	0.21	53.4

Lane Use and Performance

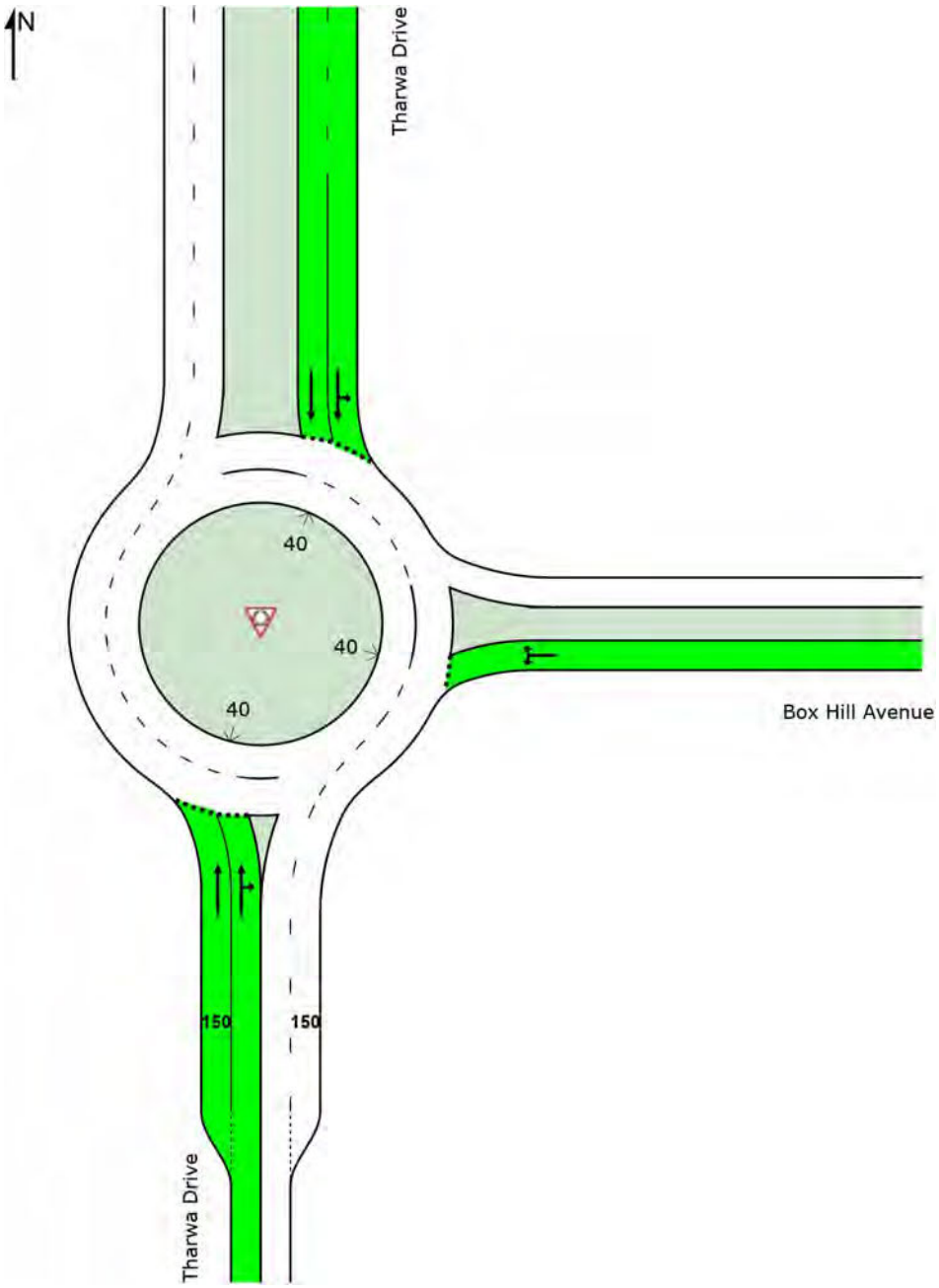
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	159	1.5	159	1.5	1301	0.122	100	3.5	LOS A	0.2	1.8	Short	150	0.0	NA
Lane 2	141	1.5	141	1.5	1160	0.122	100	4.3	LOS A	0.2	1.7	Full	990	0.0	0.0
Approach	300	1.5	300	1.5		0.122		3.9	LOS A	0.2	1.8				
East: Box Hill Avenue															
Lane 1[d]	276	1.5	276	1.5	994	0.278	100	11.6	LOS A	0.6	4.3	Full	105	0.0	0.0
Approach	276	1.5	276	1.5		0.278		11.6	LOS A	0.6	4.3				
North: Tharwa Drive															
Lane 1[d]	565	1.5	565	1.5	1743	0.324	100	3.2	LOS A	0.7	4.9	Full	640	0.0	0.0
Lane 2	488	1.5	488	1.5	1506	0.324	100	2.8	LOS A	0.7	4.8	Full	640	0.0	0.0
Approach	1054	1.5	1054	1.5		0.324		3.0	LOS A	0.7	4.9				
Intersection	1629	1.5	1629	1.5		0.324		4.6	LOS A	0.7	4.9				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

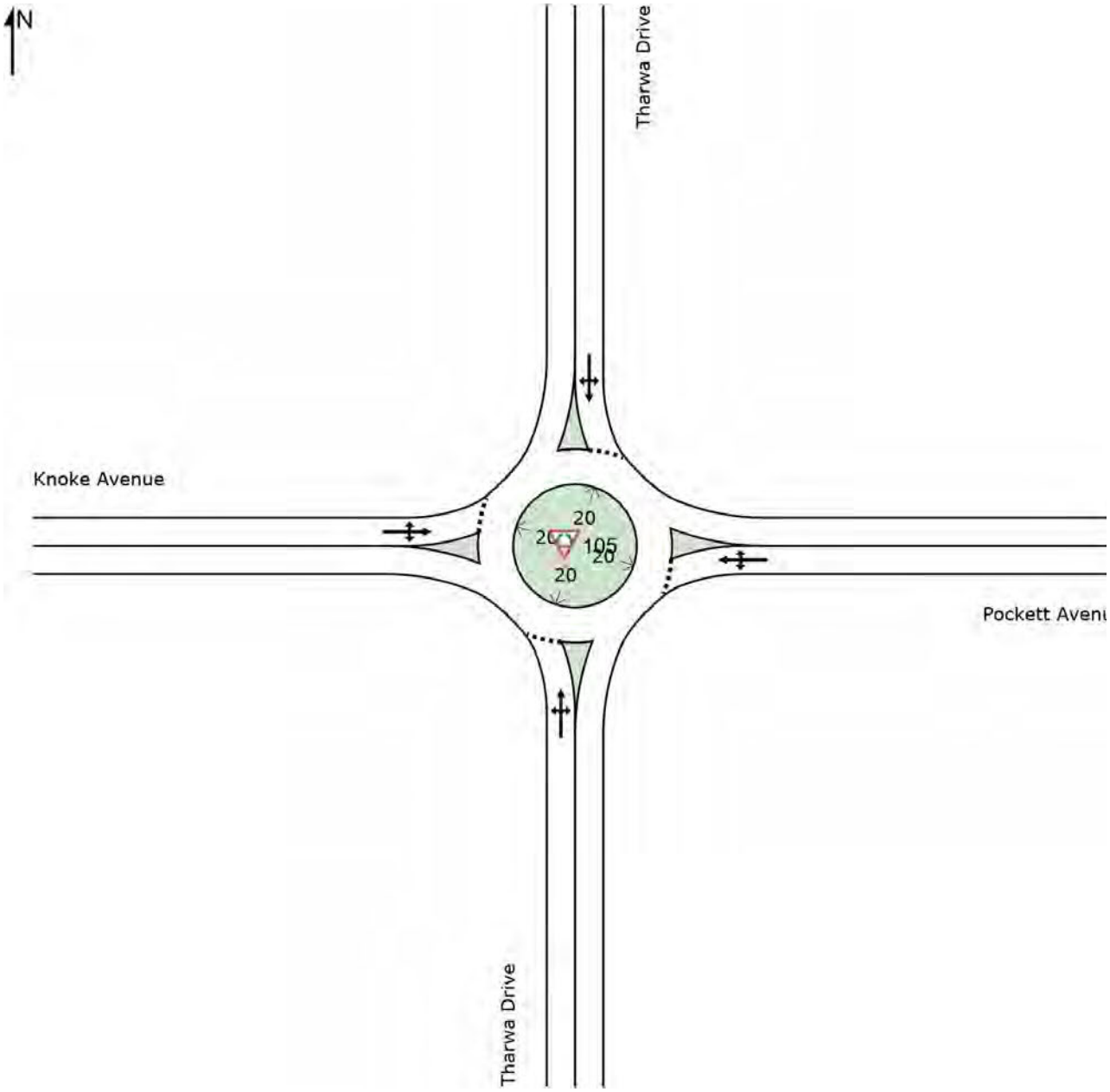
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 105 [2041_PM Peak_Tharwa Drive / Pockett Avenue - Base]

Network: 5 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op1]

Single-Lane Roundabout - Existing Layout
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.039	5.8	LOS A	0.1	0.6	0.50	0.56	0.50	49.0
2	T1	31	1.5	31	1.5	0.039	6.0	LOS A	0.1	0.6	0.50	0.56	0.50	48.5
3	R2	6	1.5	6	1.5	0.039	10.6	LOS A	0.1	0.6	0.50	0.56	0.50	47.2
Approach		39	1.5	39	1.5	0.039	6.8	LOS A	0.1	0.6	0.50	0.56	0.50	48.3
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.190	4.9	LOS A	0.4	3.0	0.46	0.66	0.46	47.4
5	T1	38	1.5	38	1.5	0.190	5.1	LOS A	0.4	3.0	0.46	0.66	0.46	12.6
6	R2	161	1.5	161	1.5	0.190	9.8	LOS A	0.4	3.0	0.46	0.66	0.46	27.4
Approach		209	1.5	209	1.5	0.190	8.7	LOS A	0.4	3.0	0.46	0.66	0.46	22.9
North: Tharwa Drive														
7	L2	309	1.5	309	1.5	0.388	4.2	LOS A	1.1	8.1	0.23	0.52	0.23	45.4
8	T1	62	1.5	62	1.5	0.388	4.4	LOS A	1.1	8.1	0.23	0.52	0.23	56.4
9	R2	211	1.5	211	1.5	0.388	9.0	LOS A	1.1	8.1	0.23	0.52	0.23	45.2
Approach		582	1.5	582	1.5	0.388	5.9	LOS A	1.1	8.1	0.23	0.52	0.23	46.6
West: Knoke Avenue														
10	L2	92	1.5	92	1.5	0.115	4.8	LOS A	0.2	1.8	0.38	0.51	0.38	32.5
11	T1	37	1.5	37	1.5	0.115	5.0	LOS A	0.2	1.8	0.38	0.51	0.38	24.2
12	R2	5	1.5	5	1.5	0.115	9.7	LOS A	0.2	1.8	0.38	0.51	0.38	52.6
Approach		134	1.5	134	1.5	0.115	5.1	LOS A	0.2	1.8	0.38	0.51	0.38	30.7
All Vehicles		964	1.5	964	1.5	0.388	6.4	LOS A	1.1	8.1	0.31	0.55	0.31	43.9

[redacted]

Lane Use and Performance

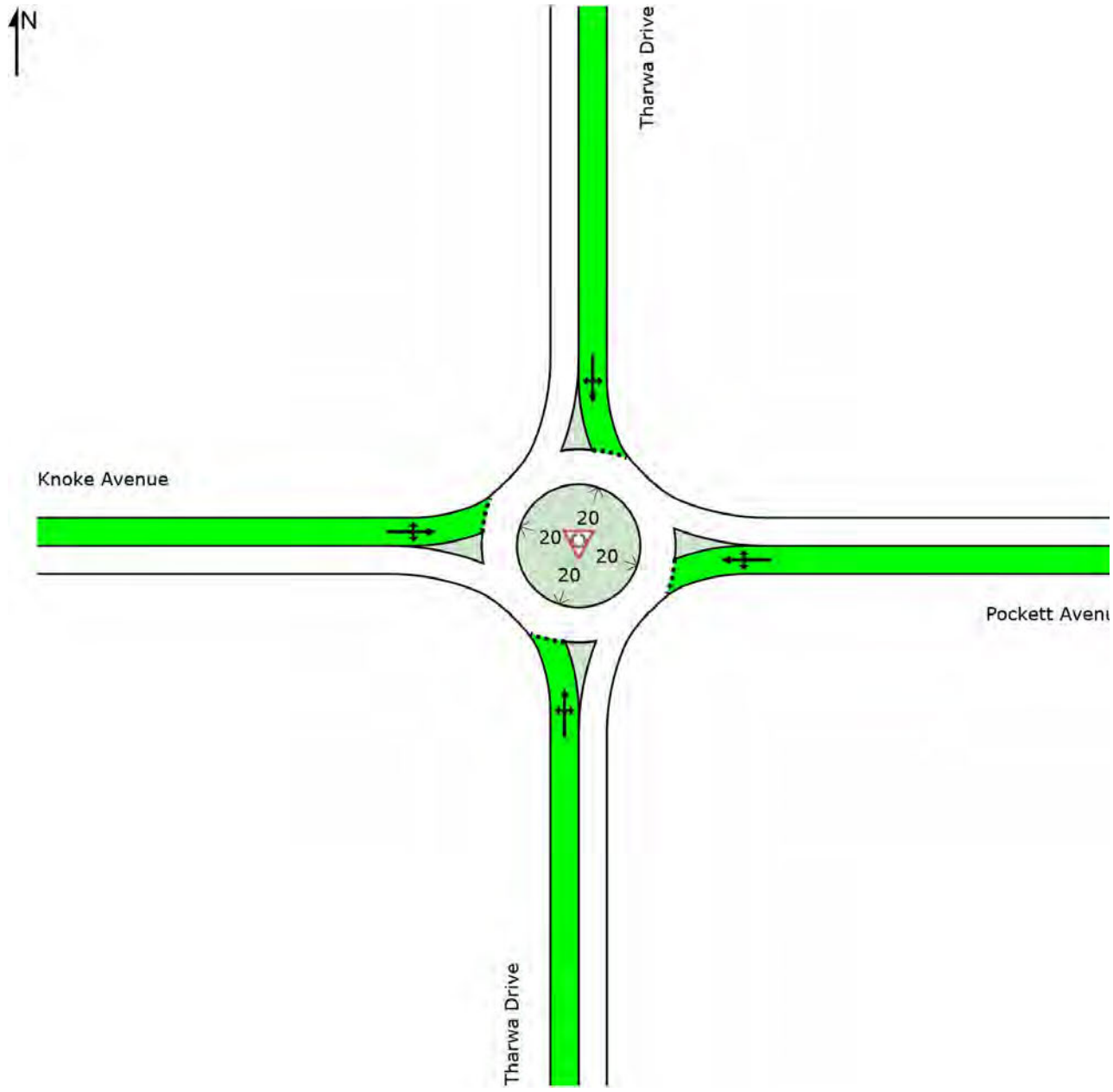
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	39	1.5	39	1.5	999	0.039	100	6.8	LOS A	0.1	0.6	Full	500	0.0	0.0
Approach	39	1.5	39	1.5		0.039		6.8	LOS A	0.1	0.6				
East: Pockett Avenue															
Lane 1[d]	209	1.5	209	1.5	1102	0.190	100	8.7	LOS A	0.4	3.0	Full	80	0.0	0.0
Approach	209	1.5	209	1.5		0.190		8.7	LOS A	0.4	3.0				
North: Tharwa Drive															
Lane 1[d]	582	1.5	582	1.5	1501	0.388	100	5.9	LOS A	1.1	8.1	Full	990	0.0	0.0
Approach	582	1.5	582	1.5		0.388		5.9	LOS A	1.1	8.1				
West: Knoke Avenue															
Lane 1[d]	134	1.5	134	1.5	1165	0.115	100	5.1	LOS A	0.2	1.8	Full	95	0.0	0.0
Approach	134	1.5	134	1.5		0.115		5.1	LOS A	0.2	1.8				
Intersection	964	1.5	964	1.5		0.388		6.4	LOS A	1.1	8.1				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

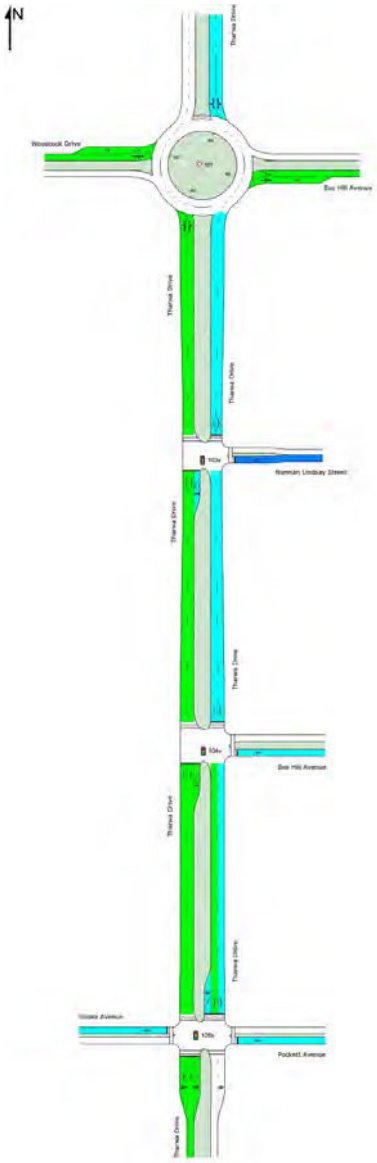
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

2041 Future Conditions - Upgraded Layout (Op2)
Network Category: (None)
Network Cycle Time = 75 seconds (Network User-Given Cycle Time)



Colour code based on Degree of Saturation

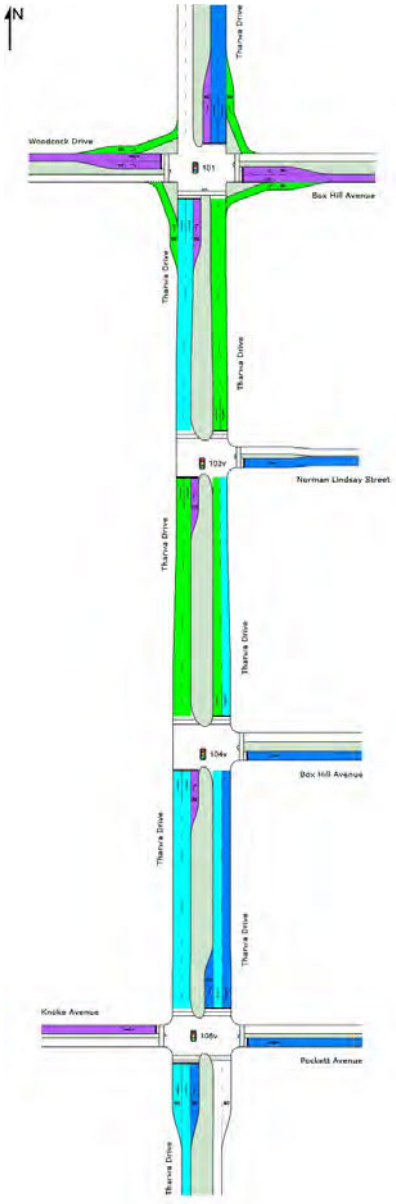
[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

2041 Future Conditions - Upgraded Layout (Op3)
Network Category: (None)
Network Cycle Time = 90 seconds (Network User-Given Cycle Time)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

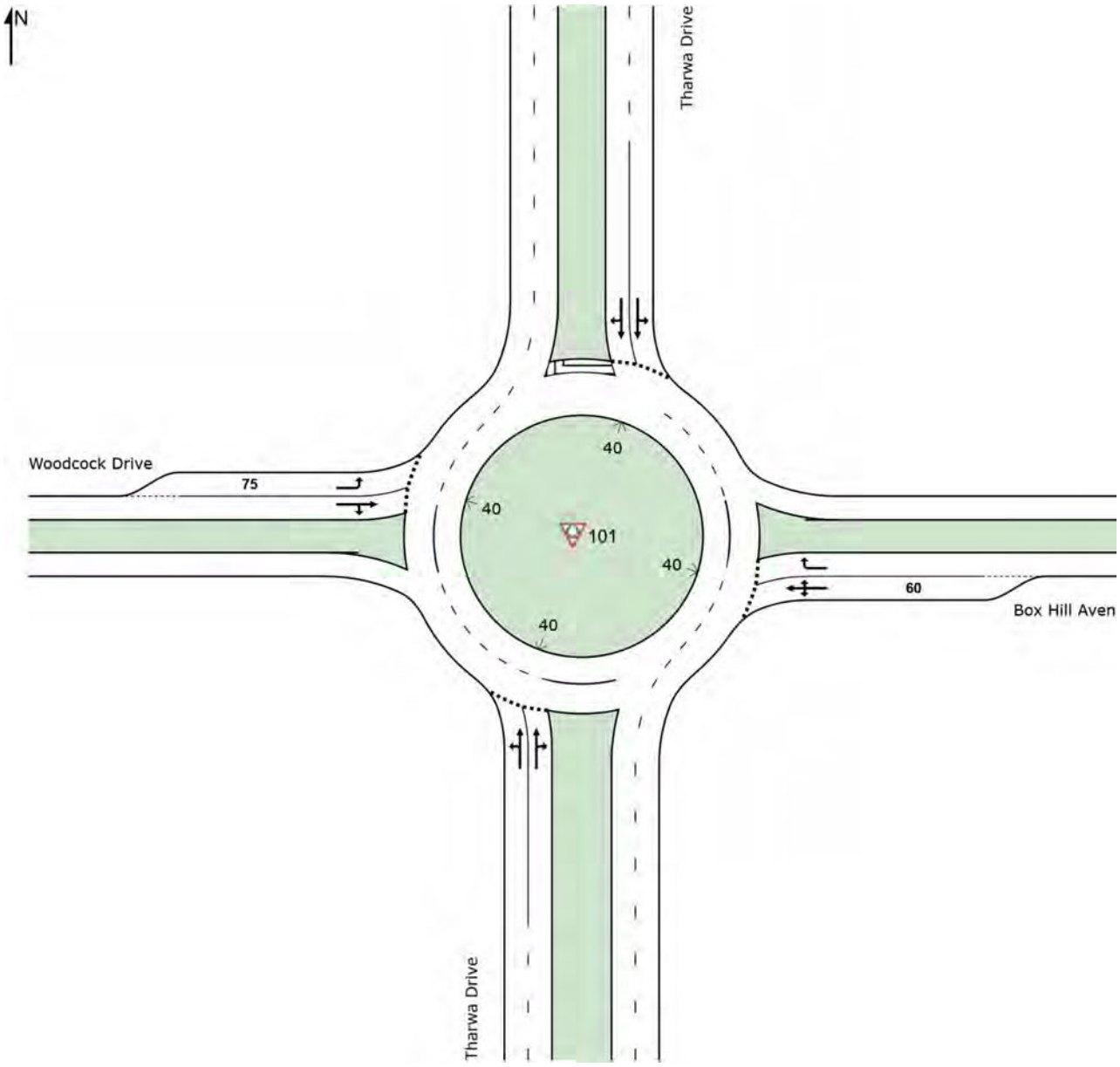
Template: Default Site User Report (2)

Site: 101 [2041_PM Peak_Tharwa Drive / Woodcock Drive - Duplicated]

Network: 7 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

Two Lane Roundabout - Duplicated
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	154	1.5	154	1.5	0.310	5.3	LOS A	0.6	4.1	0.52	0.57	0.52	50.9
2	T1	408	1.5	408	1.5	0.310	5.3	LOS A	0.6	4.1	0.54	0.56	0.54	54.7
3	R2	9	1.5	9	1.5	0.310	11.9	LOS A	0.5	3.8	0.55	0.56	0.55	43.6
Approach		572	1.5	572	1.5	0.310	5.4	LOS A	0.6	4.1	0.53	0.56	0.53	53.7
East: Box Hill Avenue														
4	L2	33	1.5	33	1.5	0.471	8.3	LOS A	1.4	9.8	0.87	0.96	1.00	31.2
5	T1	108	1.5	108	1.5	0.471	8.2	LOS A	1.4	9.8	0.87	0.96	1.00	47.3
6	R2	501	1.5	501	1.5	0.471	15.4	LOS B	1.4	9.8	0.86	0.98	1.01	48.0
Approach		642	1.5	642	1.5	0.471	13.8	LOS A	1.4	9.8	0.86	0.98	1.01	47.5
North: Tharwa Drive														
7	L2	814	1.5	814	1.5	0.685	4.5	LOS A	3.0	21.2	0.68	0.53	0.68	51.9
8	T1	993	1.5	993	1.5	0.685	4.6	LOS A	3.0	21.5	0.72	0.54	0.73	48.5
9	R2	116	1.5	116	1.5	0.685	11.7	LOS A	3.0	21.5	0.73	0.55	0.75	55.5
Approach		1922	1.5	1922	1.5	0.685	5.0	LOS A	3.0	21.5	0.70	0.54	0.71	50.6
West: Woodcock Drive														
10	L2	67	1.5	67	1.5	0.093	6.1	LOS A	0.2	1.1	0.61	0.70	0.61	54.1
11	T1	151	1.5	151	1.5	0.209	4.6	LOS A	0.4	3.0	0.63	0.60	0.63	52.0
12	R2	68	1.5	68	1.5	0.209	11.5	LOS A	0.4	3.0	0.63	0.60	0.63	45.8
Approach		286	1.5	286	1.5	0.209	6.6	LOS A	0.4	3.0	0.62	0.62	0.62	51.5
All Vehicles		3422	1.5	3422	1.5	0.685	6.8	LOS A	3.0	21.5	0.70	0.63	0.73	50.5

[redacted]

Lane Use and Performance

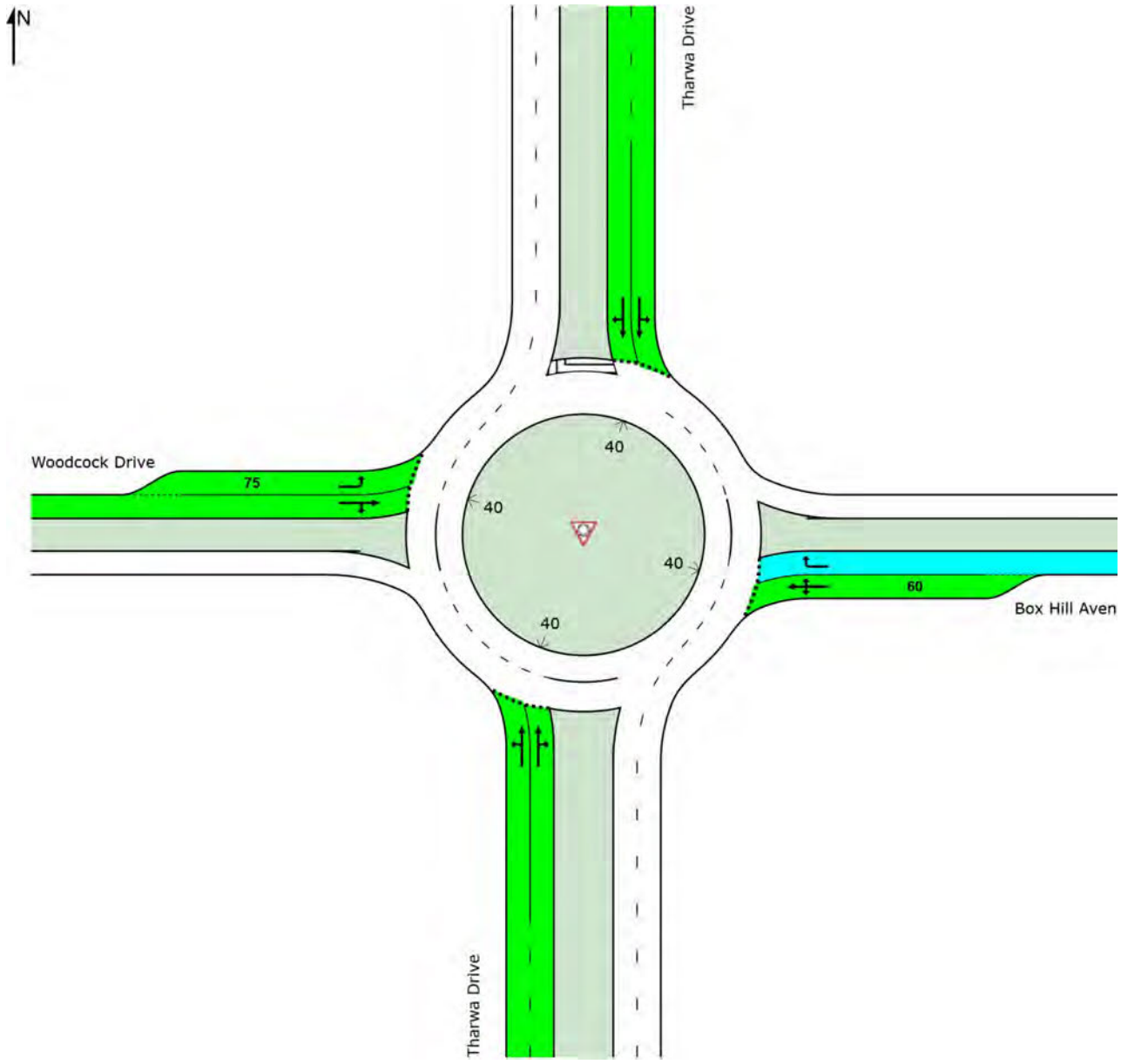
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	314	1.5	314	1.5	1014	0.310	100	5.1	LOS A	0.6	4.1	Full	165	0.0	0.0
Lane 2	258	1.5	258	1.5	832	0.310	100	5.7	LOS A	0.5	3.8	Full	165	0.0	0.0
Approach	572	1.5	572	1.5		0.310		5.4	LOS A	0.6	4.1				
East: Box Hill Avenue															
Lane 1[d]	367	1.5	367	1.5	779	0.471	100	12.1	LOS A	1.4	9.8	Short	60	0.0	NA
Lane 2	275	1.5	275	1.5	585	0.471	100	16.1	LOS B	1.2	8.8	Full	150	0.0	0.0
Approach	642	1.5	642	1.5		0.471		13.8	LOS A	1.4	9.8				
North: Tharwa Drive															
Lane 1[d]	1065	1.5	1065	1.5	1556	0.685	100	4.4	LOS A	3.0	21.2	Full	490	0.0	0.0
Lane 2	857	1.5	857	1.5	1251	0.685	100	5.7	LOS A	3.0	21.5	Full	490	0.0	0.0
Approach	1922	1.5	1922	1.5		0.685		5.0	LOS A	3.0	21.5				
West: Woodcock Drive															
Lane 1	67	1.5	67	1.5	722	0.093	100	6.1	LOS A	0.2	1.1	Short	75	0.0	NA
Lane 2[d]	219	1.5	219	1.5	1047	0.209	100	6.7	LOS A	0.4	3.0	Full	380	0.0	0.0
Approach	286	1.5	286	1.5		0.209		6.6	LOS A	0.4	3.0				
Intersection	3422	1.5	3422	1.5		0.685		6.8	LOS A	3.0	21.5				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

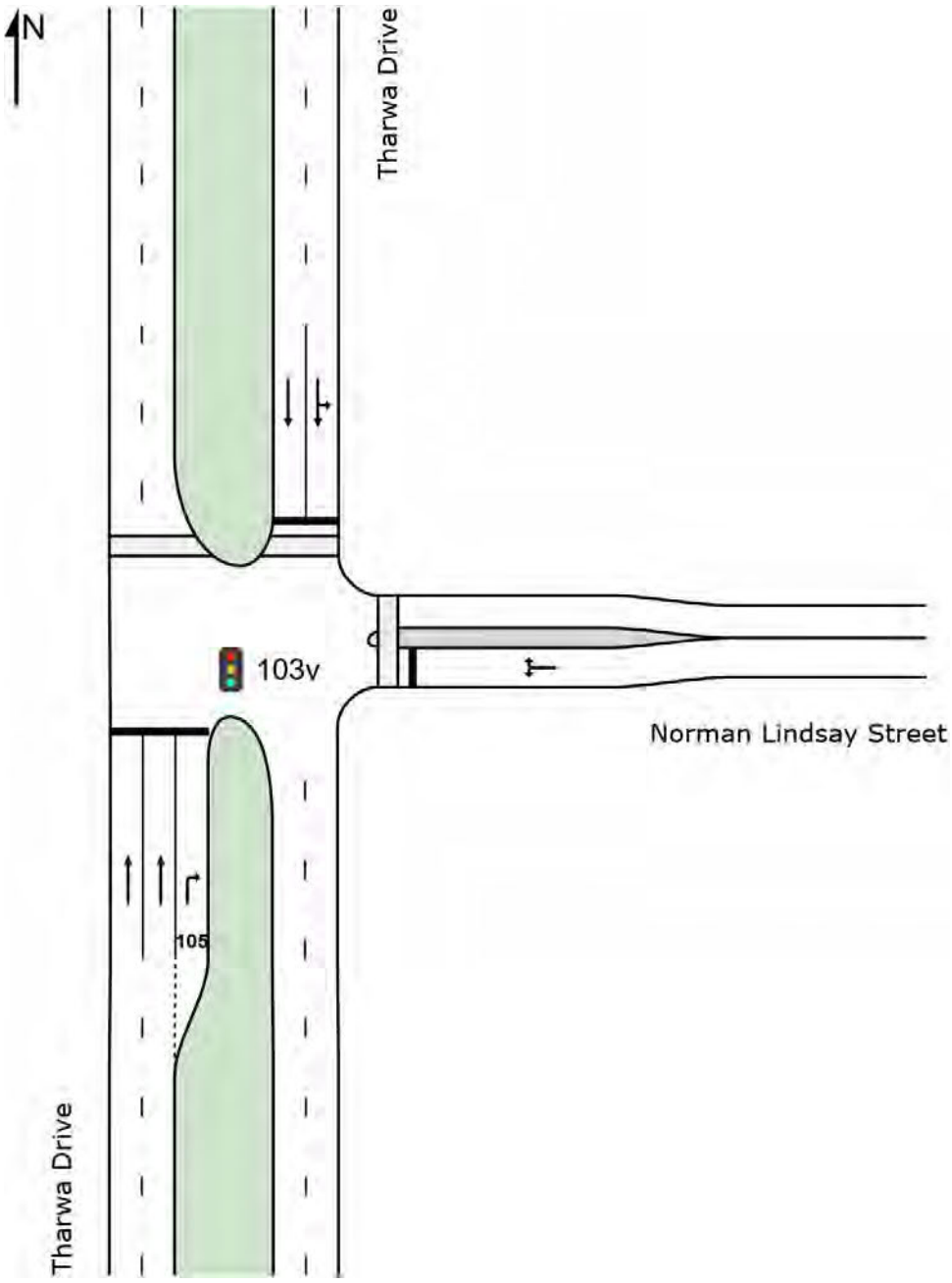
Site: 103v [2041_PM Peak_Tharwa Drive / Norman Lindsay Street - Upgraded]

Network: 7 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

Signalised T-Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	437	1.5	437	1.5	0.189	9.8	LOS A	3.6	25.5	0.67	0.57	0.67	47.9
3	R2	109	1.5	109	1.5	0.638	36.5	LOS C	2.3	16.6	0.92	0.78	0.95	31.1
Approach		546	1.5	546	1.5	0.638	15.2	LOS B	3.6	25.5	0.72	0.61	0.73	43.0
East: Norman Lindsay Street														
4	L2	203	1.5	203	1.5	0.737	34.4	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
6	R2	134	1.5	134	1.5	0.737	34.3	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
Approach		337	1.5	337	1.5	0.737	34.4	LOS C	7.5	53.1	0.98	0.88	1.08	5.2
North: Tharwa Drive														
7	L2	247	1.5	247	1.5	0.671	24.3	LOS B	9.8	69.7	0.86	0.80	0.86	10.5
8	T1	846	1.5	846	1.5	0.671	18.8	LOS B	10.0	71.2	0.86	0.77	0.86	21.0
Approach		1094	1.5	1094	1.5	0.671	20.0	LOS B	10.0	71.2	0.86	0.78	0.86	16.6
All Vehicles		1977	1.5	1977	1.5	0.737	21.1	LOS B	10.0	71.2	0.84	0.75	0.86	24.1

[redacted]

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	218	1.5	218	1.5	1159	0.189	100	11.7	LOS A	3.6	25.5	Full	640	0.0	0.0
Lane 2	218	1.5	218	1.5	1159	0.189	100	8.0	LOS A	2.6	18.1	Full	640	0.0	0.0
Lane 3	109	1.5	109	1.5	171	0.638	100	36.5	LOS C	2.3	16.6	Short	105	0.0	NA
Approach	546	1.5	546	1.5		0.638		15.2	LOS B	3.6	25.5				
East: Norman Lindsay Street															
Lane 1	337	1.5	337	1.5	457	0.737	100	34.4	LOS C	7.5	53.1	Full	40	0.0	77.1
Approach	337	1.5	337	1.5		0.737		34.4	LOS C	7.5	53.1				
North: Tharwa Drive															
Lane 1	541	1.5	541	1.5	805	0.671	100	21.3	LOS B	9.8	69.7	Full	165	0.0	0.0
Lane 2	553	1.5	553	1.5	824	0.671	100	18.7	LOS B	10.0	71.2	Full	165	0.0	0.0
Approach	1094	1.5	1094	1.5		0.671		20.0	LOS B	10.0	71.2				
Intersection	1977	1.5	1977	1.5		0.737		21.1	LOS B	10.0	71.2				

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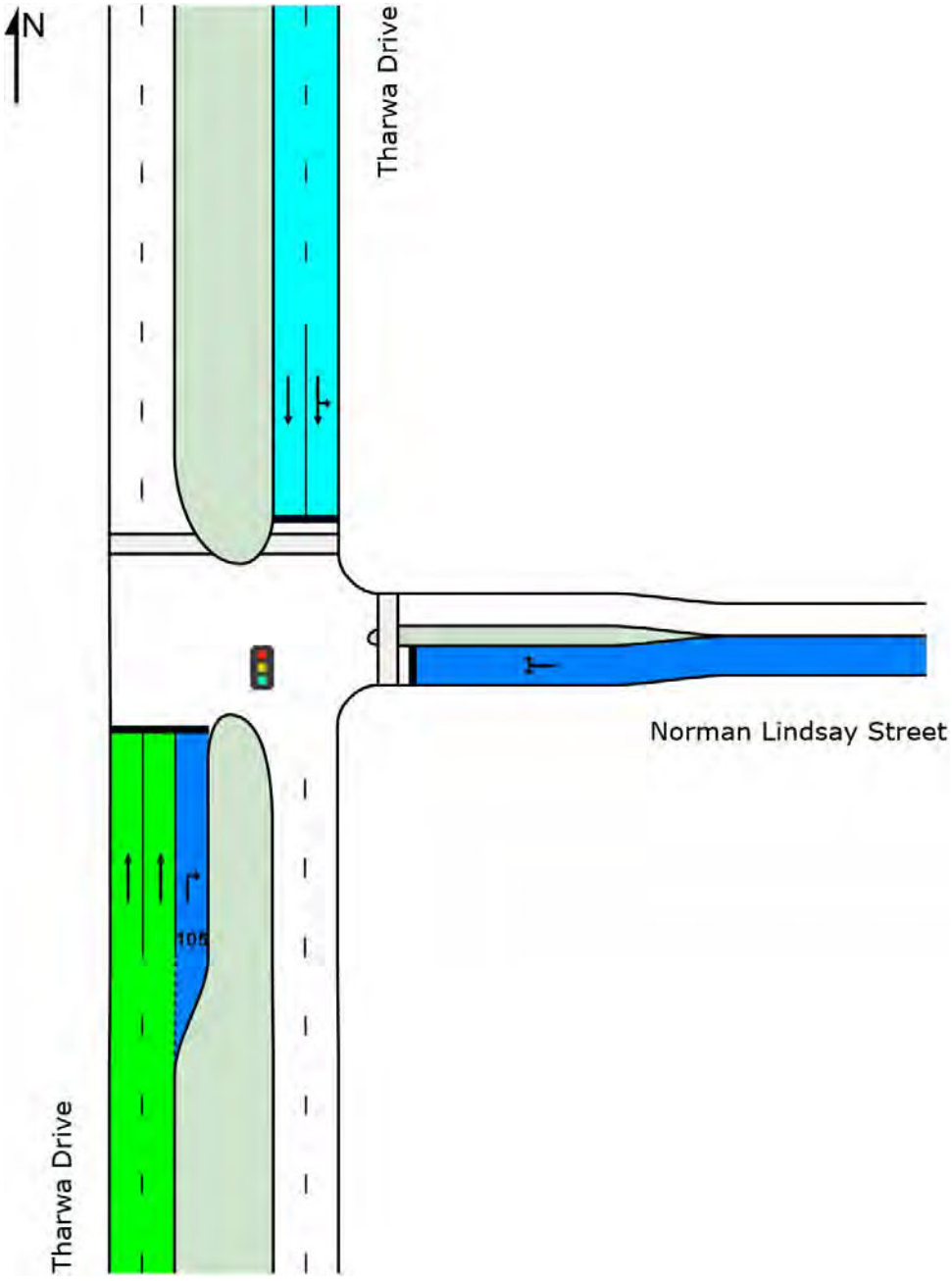
Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	B	C	B	B



Colour code based on Level of Service

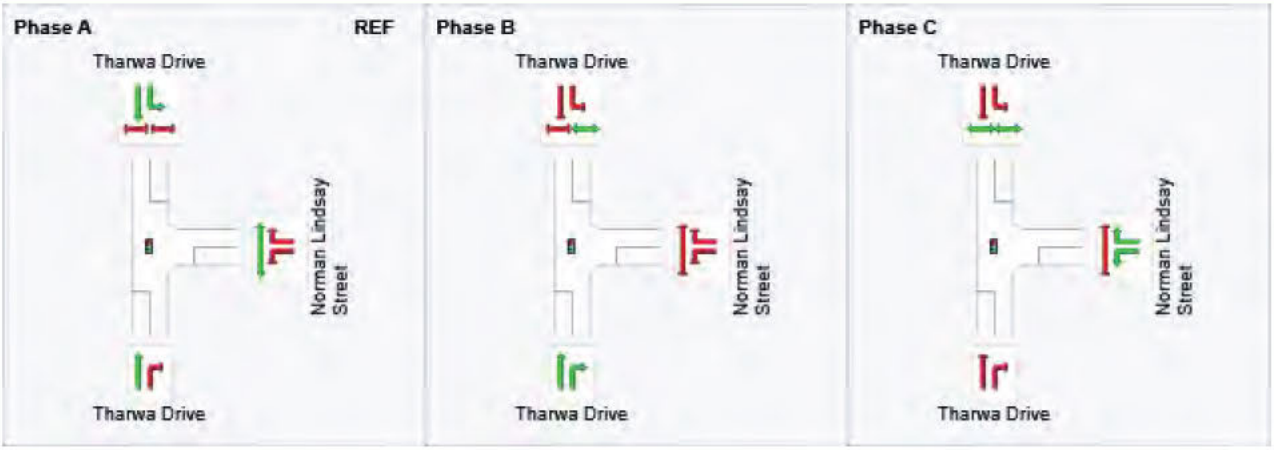
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

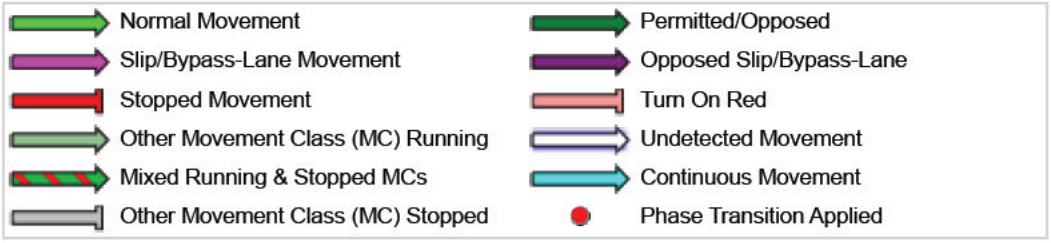
Phase	A	B	C
Phase Change Time (sec)	0	38	51
Green Time (sec)	32	7	18
Phase Time (sec)	38	13	24
Phase Split	51%	17%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



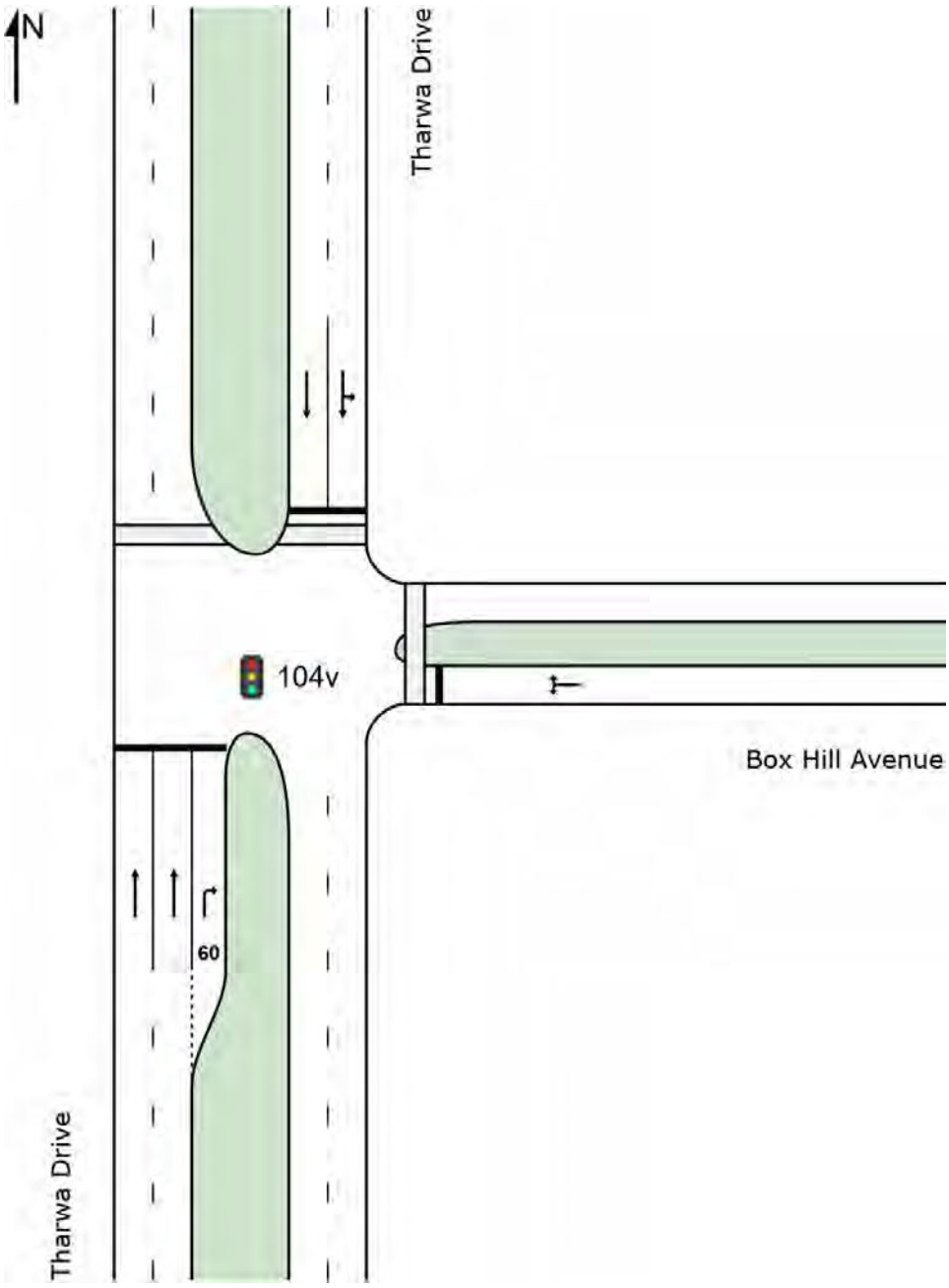
Site: 104v [2041_PM Peak_Tharwa Drive / Box Hill Avenue - Signals]

Network: 7 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

Signalised T-intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	286	1.5	286	1.5	0.119	9.6	LOS A	2.6	18.3	0.59	0.49	0.59	51.7
3	R2	14	1.5	14	1.5	0.092	27.3	LOS B	0.2	1.3	0.59	0.64	0.59	41.8
Approach		300	1.5	300	1.5	0.119	10.4	LOS A	2.6	18.3	0.59	0.49	0.59	51.1
East: Box Hill Avenue														
4	L2	14	1.5	14	1.5	0.603	33.6	LOS C	5.7	40.1	0.94	0.82	0.94	10.7
6	R2	262	1.5	262	1.5	0.603	33.6	LOS C	5.7	40.1	0.94	0.82	0.94	10.7
Approach		276	1.5	276	1.5	0.603	33.6	LOS C	5.7	40.1	0.94	0.82	0.94	10.7
North: Tharwa Drive														
7	L2	486	1.5	486	1.5	0.612	22.0	LOS B	8.0	56.5	0.74	0.79	0.74	39.6
8	T1	567	1.5	567	1.5	0.612	4.8	LOS A	8.0	56.5	0.33	0.30	0.33	53.1
Approach		1054	1.5	1054	1.5	0.612	12.7	LOS A	8.0	56.5	0.52	0.53	0.52	45.4
All Vehicles		1629	1.5	1629	1.5	0.612	15.8	LOS B	8.0	56.5	0.60	0.57	0.60	42.4

[redacted]

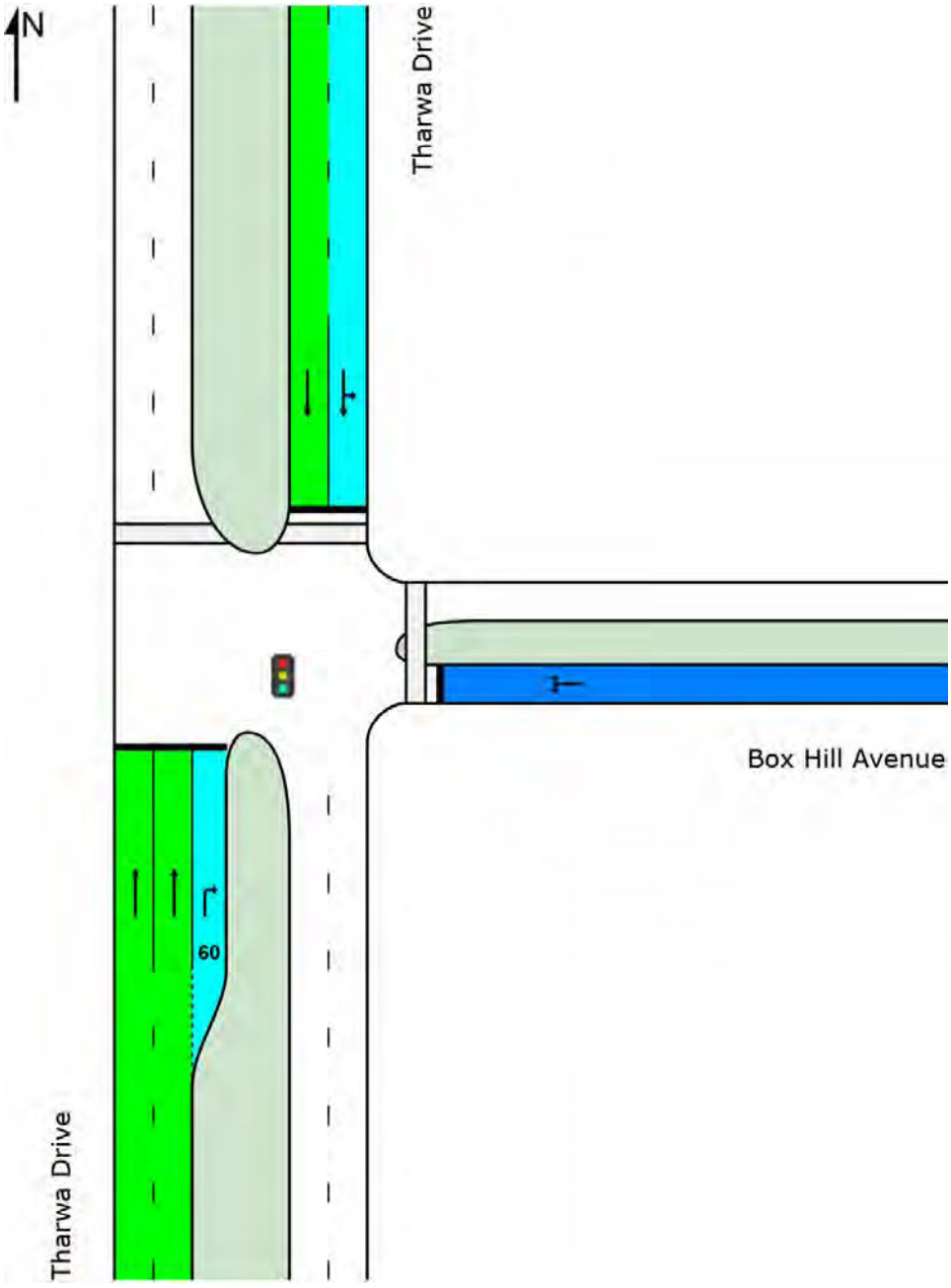
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	143	1.5	143	1.5	1201	0.119	100	13.7	LOS A	2.6	18.3	Full	990	0.0	0.0
Lane 2	143	1.5	143	1.5	1201	0.119	100	5.6	LOS A	1.0	6.9	Full	990	0.0	0.0
Lane 3	14	1.5	14	1.5	149	0.092	100	27.3	LOS B	0.2	1.3	Short	60	0.0	NA
Approach	300	1.5	300	1.5		0.119		10.4	LOS A	2.6	18.3				
East: Box Hill Avenue															
Lane 1	276	1.5	276	1.5	457	0.603	100	33.6	LOS C	5.7	40.1	Full	105	0.0	0.0
Approach	276	1.5	276	1.5		0.603		33.6	LOS C	5.7	40.1				
North: Tharwa Drive															
Lane 1	514	1.5	514	1.5	840	0.612	100	21.7	LOS B	8.0	56.5	Full	640	0.0	0.0
Lane 2	539	1.5	539	1.5	881	0.612	100	4.2	LOS A	3.5	24.7	Full	640	0.0	0.0
Approach	1054	1.5	1054	1.5		0.612		12.7	LOS A	8.0	56.5				
Intersection	1629	1.5	1629	1.5		0.612		15.8	LOS B	8.0	56.5				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	C	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

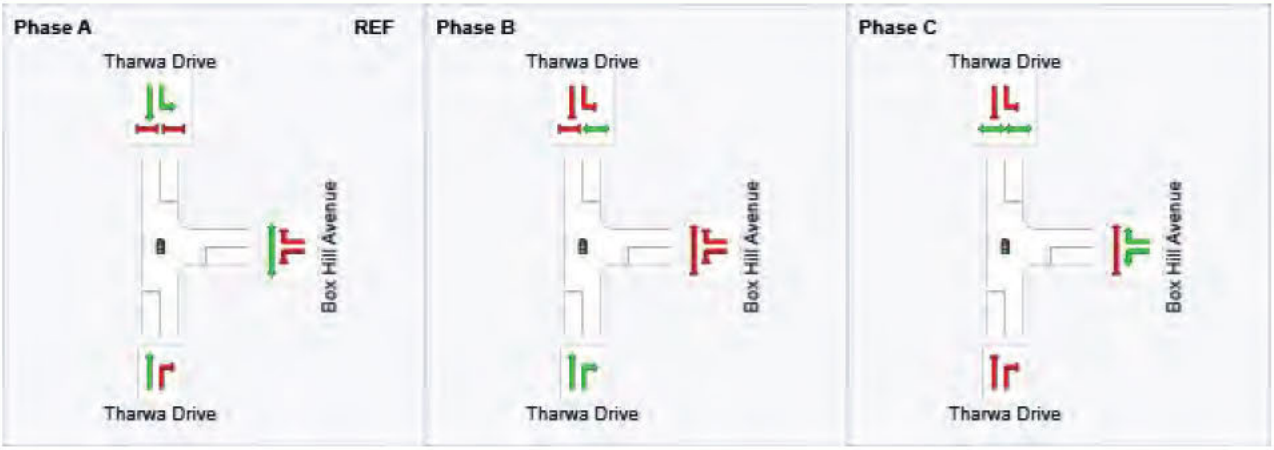
[redacted]

Phase Timing Summary

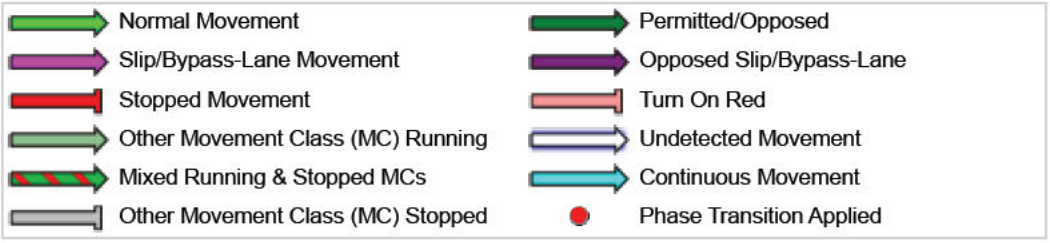
Phase	A	B	C
Phase Change Time (sec)	29	68	5
Green Time (sec)	33	6	18
Phase Time (sec)	39	12	24
Phase Split	52%	16%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



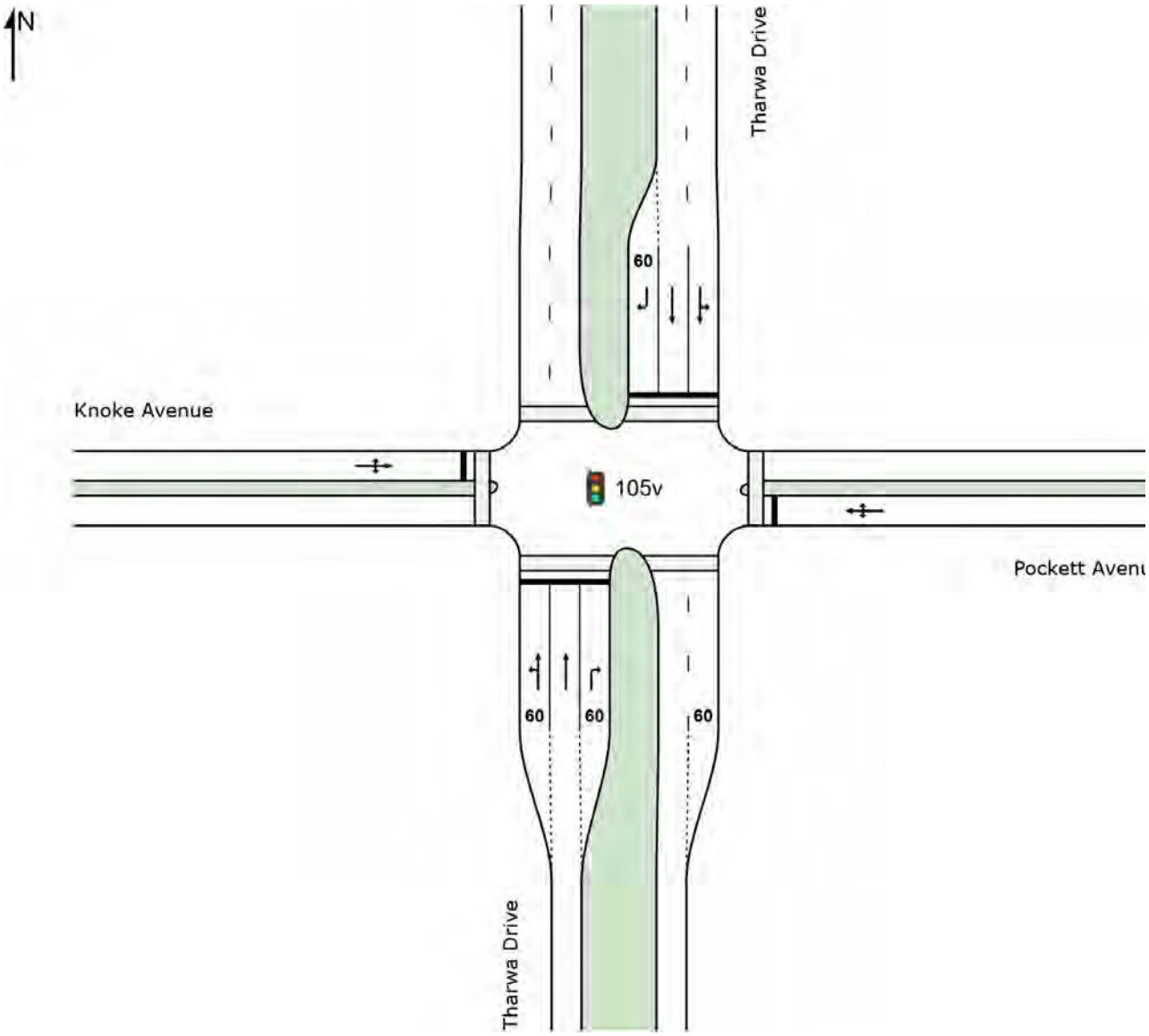
Site: 105v [2041_PM Peak_Tharwa Drive / Pockett Avenue - Signals]

Network: 7 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op2]

Signalised Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 75 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Diamond Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.034	29.1	LOS C	0.3	2.0	0.79	0.58	0.79	17.8
2	T1	31	1.5	31	1.5	0.034	23.5	LOS B	0.3	2.0	0.79	0.57	0.79	33.7
3	R2	6	1.5	6	1.5	0.019	33.5	LOS C	0.1	0.8	0.85	0.65	0.85	29.8
Approach		39	1.5	39	1.5	0.034	25.5	LOS B	0.3	2.0	0.80	0.58	0.80	31.3
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.681	39.5	LOS C	4.7	33.6	0.99	0.86	1.08	28.3
5	T1	38	1.5	38	1.5	0.681	34.4	LOS C	4.7	33.6	0.99	0.86	1.08	14.0
6	R2	161	1.5	161	1.5	0.681	39.5	LOS C	4.7	33.6	0.99	0.86	1.08	8.1
Approach		209	1.5	209	1.5	0.681	38.6	LOS C	4.7	33.6	0.99	0.86	1.08	10.9
North: Tharwa Drive														
7	L2	309	1.5	309	1.5	0.677	41.4	LOS C	7.1	50.1	1.00	0.85	1.02	35.8
8	T1	62	1.5	62	1.5	0.129	30.5	LOS C	1.4	9.6	1.00	0.77	1.00	44.8
9	R2	211	1.5	211	1.5	0.638	38.6	LOS C	4.8	33.8	1.00	0.83	1.03	37.0
Approach		582	1.5	582	1.5	0.677	39.2	LOS C	7.1	50.1	1.00	0.84	1.02	37.3
West: Knoke Avenue														
10	L2	92	1.5	92	1.5	0.649	43.1	LOS D	3.1	22.1	1.00	0.83	1.10	8.4
11	T1	37	1.5	37	1.5	0.649	37.6	LOS C	3.1	22.1	1.00	0.83	1.10	13.1
12	R2	5	1.5	5	1.5	0.649	43.1	LOS D	3.1	22.1	1.00	0.83	1.10	27.7
Approach		134	1.5	134	1.5	0.649	41.6	LOS C	3.1	22.1	1.00	0.83	1.10	10.9
All Vehicles		964	1.5	964	1.5	0.681	38.9	LOS C	7.1	50.1	0.99	0.83	1.03	31.8

[redacted]

Lane Use and Performance

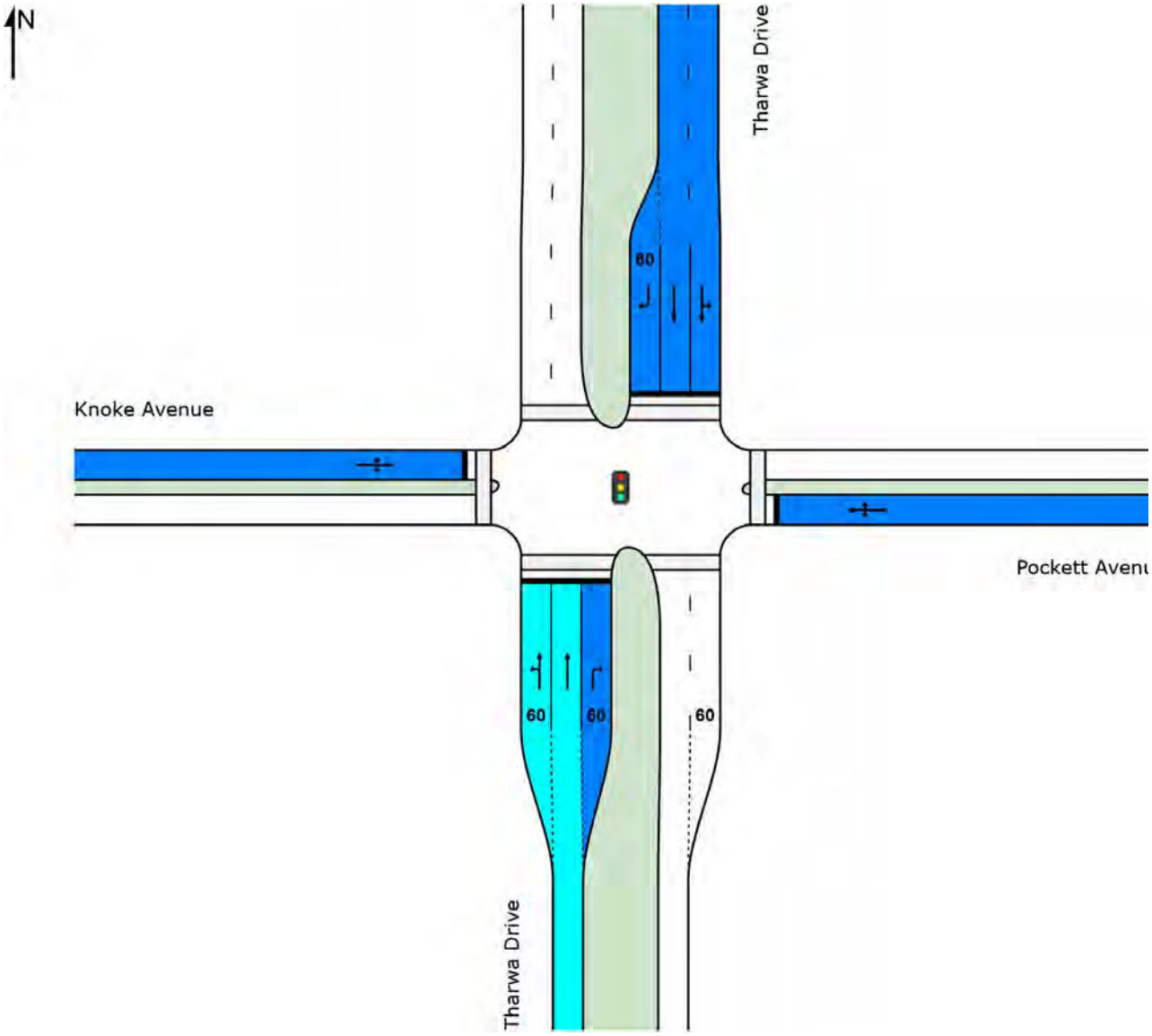
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	16	1.5	16	1.5	477	0.034	100	24.3	LOS B	0.3	2.0	Short	60	0.0	NA
Lane 2	16	1.5	16	1.5	480	0.034	100	23.5	LOS B	0.3	2.0	Full	500	0.0	0.0
Lane 3	6	1.5	6	1.5	330	0.019	100	33.5	LOS C	0.1	0.8	Short	60	0.0	NA
Approach	39	1.5	39	1.5		0.034		25.5	LOS B	0.3	2.0				
East: Pockett Avenue															
Lane 1	209	1.5	209	1.5	307	0.681	100	38.6	LOS C	4.7	33.6	Full	80	0.0	0.0
Approach	209	1.5	209	1.5		0.681		38.6	LOS C	4.7	33.6				
North: Tharwa Drive															
Lane 1	309	1.5	309	1.5	457	0.677	100	41.4	LOS C	7.1	50.1	Full	990	0.0	0.0
Lane 2	62	1.5	62	1.5	480	0.129	19[5]	30.5	LOS C	1.4	9.6	Full	990	0.0	0.0
Lane 3	211	1.5	211	1.5	330	0.638	100	38.6	LOS C	4.8	33.8	Short	60	0.0	NA
Approach	582	1.5	582	1.5		0.677		39.2	LOS C	7.1	50.1				
West: Knoke Avenue															
Lane 1	134	1.5	134	1.5	206	0.649	100	41.6	LOS C	3.1	22.1	Full	95	0.0	0.0
Approach	134	1.5	134	1.5		0.649		41.6	LOS C	3.1	22.1				
Intersection	964	1.5	964	1.5		0.681		38.9	LOS C	7.1	50.1				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

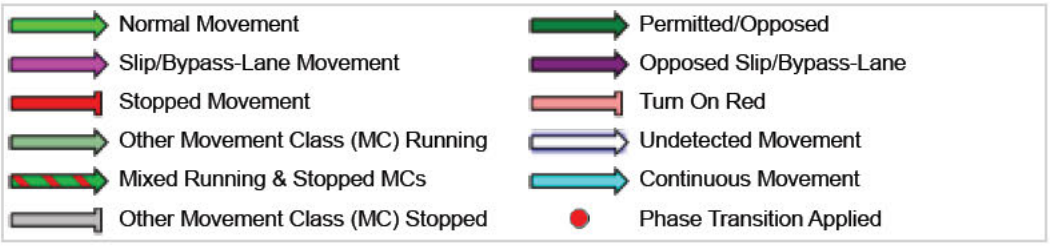
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	45	69	13	31
Green Time (sec)	18	13	12	8
Phase Time (sec)	24	19	18	14
Phase Split	32%	25%	24%	19%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

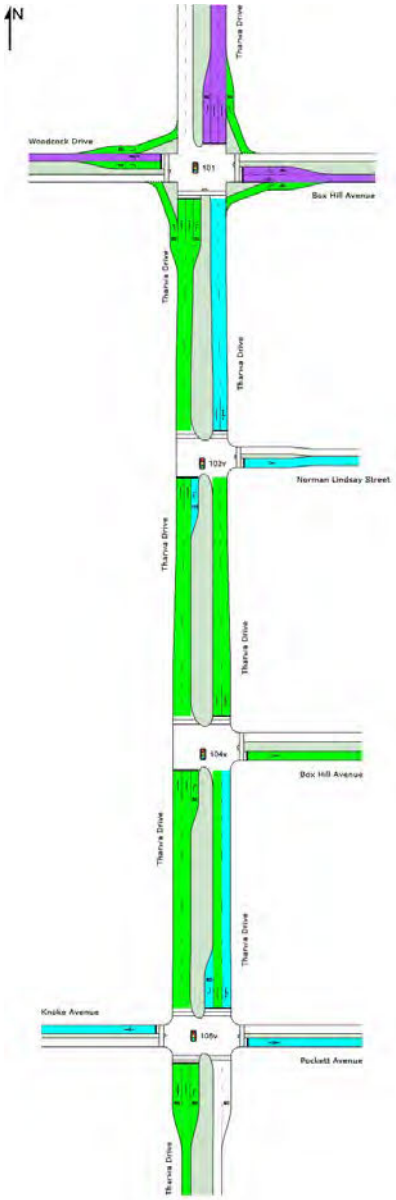


DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

2041 Future Conditions - Upgraded Layout (Op3)
Network Category: (None)
Network Cycle Time = 90 seconds (Network User-Given Cycle Time)



Colour code based on Degree of Saturation

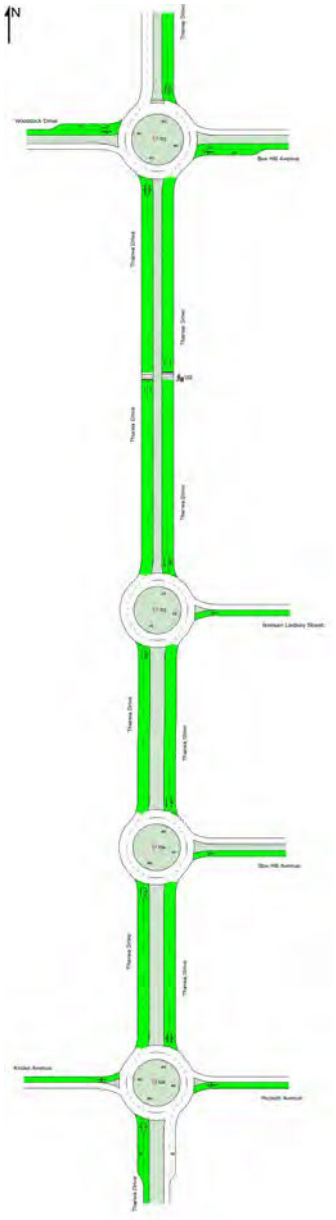
[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive AM peak - Op4]

2041 Future Conditions - Upgraded Layout
Network Category: (None)



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

Template: Default Site User Report (2)

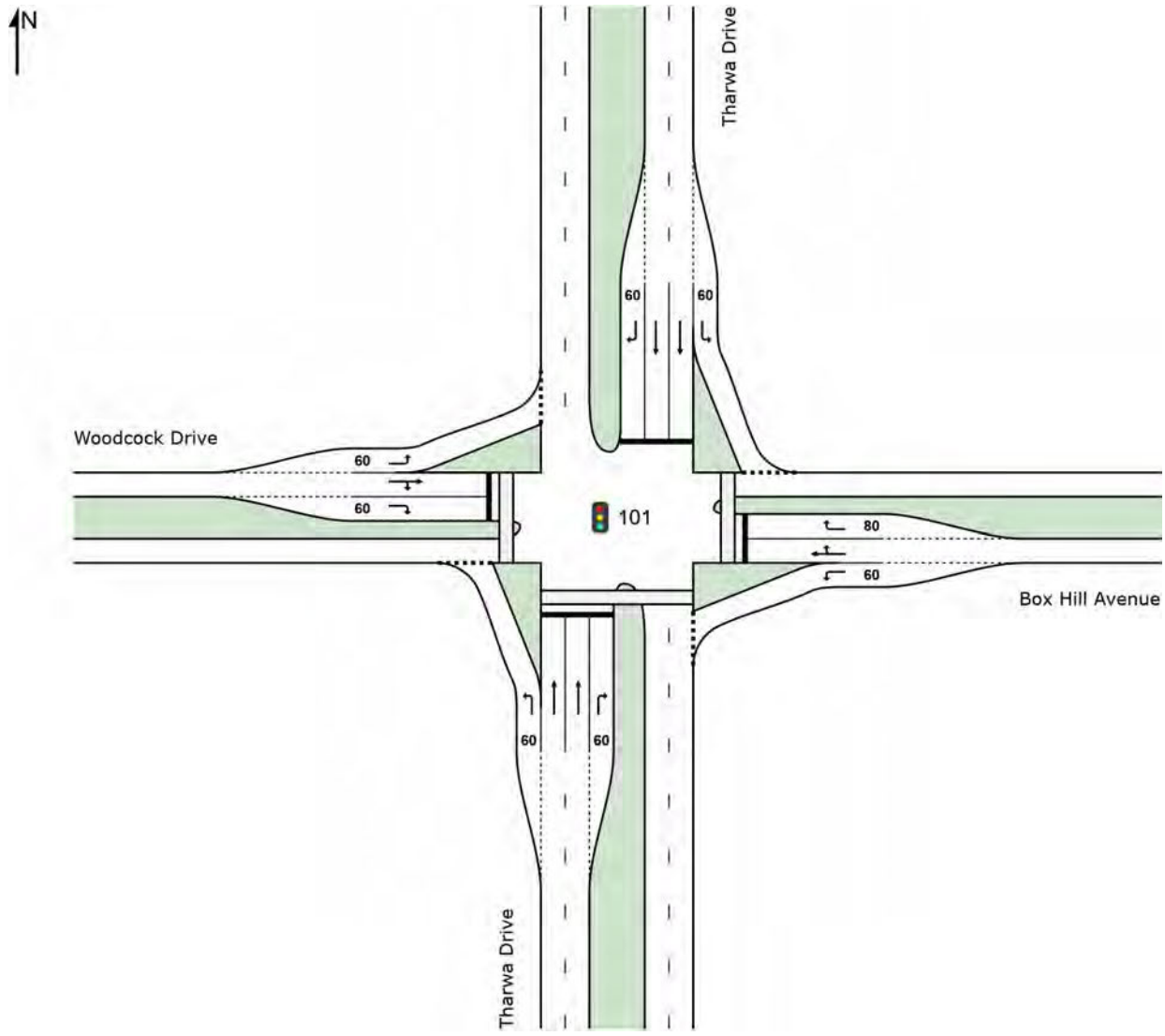
Site: 101 [2041_PM Peak_Tharwa Drive / Woodcock Drive - Signals]

Network: 9 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

SIgnalised Cross Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	154	1.5	154	1.5	0.111	6.2	LOS A	0.2	1.5	0.07	0.57	0.07	49.7
2	T1	408	1.5	408	1.5	0.277	17.5	LOS B	2.9	20.7	0.56	0.47	0.56	41.9
3	R2	9	1.5	9	1.5	0.066	48.8	LOS D	0.3	1.8	0.97	0.67	0.97	17.1
Approach		572	1.5	572	1.5	0.277	15.0	LOS B	2.9	20.7	0.44	0.50	0.44	42.9
East: Box Hill Avenue														
4	L2	33	1.5	33	1.5	0.036	12.1	LOS A	0.3	2.3	0.45	0.64	0.45	27.7
5	T1	108	1.5	108	1.5	0.861	47.0	LOS D	9.3	66.0	1.00	1.01	1.30	23.7
6	R2	501	1.5	501	1.5	0.861	52.7	LOS D	9.3	66.0	1.00	0.99	1.30	25.7
Approach		642	1.5	642	1.5	0.861	49.6	LOS D	9.3	66.0	0.97	0.98	1.26	25.4
North: Tharwa Drive														
7	L2	814	1.5	814	1.5	0.554	7.9	LOS A	5.9	41.6	0.40	0.68	0.40	48.9
8	T1	993	1.5	993	1.5	0.863	35.6	LOS C	16.1	113.8	0.90	0.95	1.13	27.6
9	R2	116	1.5	116	1.5	0.802	56.1	LOS D	3.5	24.5	1.00	0.91	1.33	28.9
Approach		1922	1.5	1922	1.5	0.863	25.1	LOS B	16.1	113.8	0.70	0.83	0.83	34.9
West: Woodcock Drive														
10	L2	67	1.5	67	1.5	0.060	9.7	LOS A	0.5	3.7	0.38	0.64	0.38	50.0
11	T1	151	1.5	151	1.5	0.868	52.8	LOS D	4.6	32.9	1.00	0.99	1.45	23.2
12	R2	68	1.5	68	1.5	0.415	49.9	LOS D	1.8	13.1	0.99	0.76	0.99	19.5
Approach		286	1.5	286	1.5	0.868	42.0	LOS C	4.6	32.9	0.85	0.85	1.08	27.6
All Vehicles		3422	1.5	3422	1.5	0.868	29.4	LOS C	16.1	113.8	0.72	0.81	0.87	32.9

[redacted]

Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	154	1.5	154	1.5	1381	0.111	100	6.2	LOS A	0.2	1.5	Short	60	0.0	NA
Lane 2	204	1.5	204	1.5	737	0.277	100	17.5	LOS B	2.9	20.7	Full	165	0.0	0.0
Lane 3	204	1.5	204	1.5	737	0.277	100	17.5	LOS B	2.9	20.7	Full	165	0.0	0.0
Lane 4	9	1.5	9	1.5	144	0.066	100	48.8	LOS D	0.3	1.8	Short	60	0.0	NA
Approach	572	1.5	572	1.5		0.277		15.0	LOS B	2.9	20.7				
East: Box Hill Avenue															
Lane 1	33	1.5	33	1.5	908	0.036	100	12.1	LOS A	0.3	2.3	Short	60	0.0	NA
Lane 2	307	1.5	307	1.5	357	0.861	100	50.6	LOS D	9.3	66.0	Full	150	0.0	0.0
Lane 3	302	1.5	302	1.5	351	0.861	100	52.7	LOS D	9.2	65.0	Short	80	0.0	NA
Approach	642	1.5	642	1.5		0.861		49.6	LOS D	9.3	66.0				
North: Tharwa Drive															
Lane 1	814	1.5	814	1.5	1470	0.554	100	7.9	LOS A	5.9	41.6	Short	60	0.0	NA
Lane 2	420	1.5	420	1.5	487[1]	0.863	100	35.8	LOS C	11.2	79.7	Full	490	0.0	0.0
Lane 3	572	1.5	572	1.5	663[1]	0.863	100	35.5	LOS C	16.1	113.8	Full	490	0.0	0.0
Lane 4	116	1.5	116	1.5	144	0.802	100	56.1	LOS D	3.5	24.5	Short	60	0.0	NA
Approach	1922	1.5	1922	1.5		0.863		25.1	LOS B	16.1	113.8				
West: Woodcock Drive															
Lane 1	67	1.5	67	1.5	1115	0.060	100	9.7	LOS A	0.5	3.7	Short	60	0.0	NA
Lane 2	151	1.5	151	1.5	173	0.868	100	52.8	LOS D	4.6	32.9	Full	380	0.0	0.0
Lane 3	68	1.5	68	1.5	165	0.415	48[5]	49.9	LOS D	1.8	13.1	Short	60	0.0	NA
Approach	286	1.5	286	1.5		0.868		42.0	LOS C	4.6	32.9				
Intersection	3422	1.5	3422	1.5		0.868		29.4	LOS C	16.1	113.8				

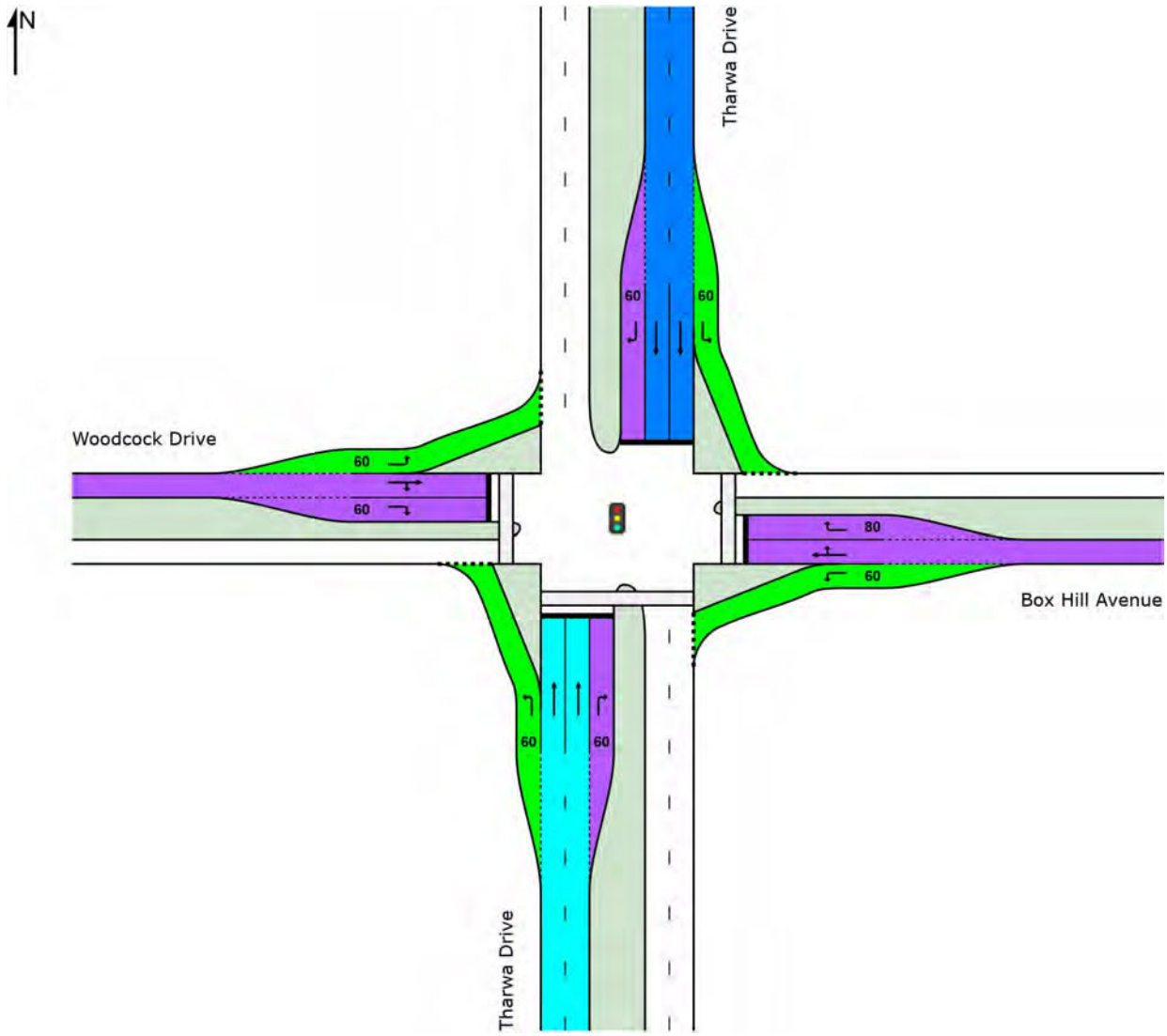
[redacted]

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	B	D	B	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

[redacted]

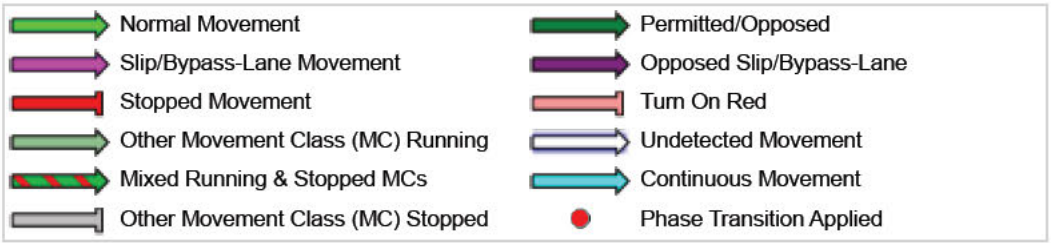
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	0	40	63	77
Green Time (sec)	34	17	8	7
Phase Time (sec)	40	23	14	13
Phase Split	44%	26%	16%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase



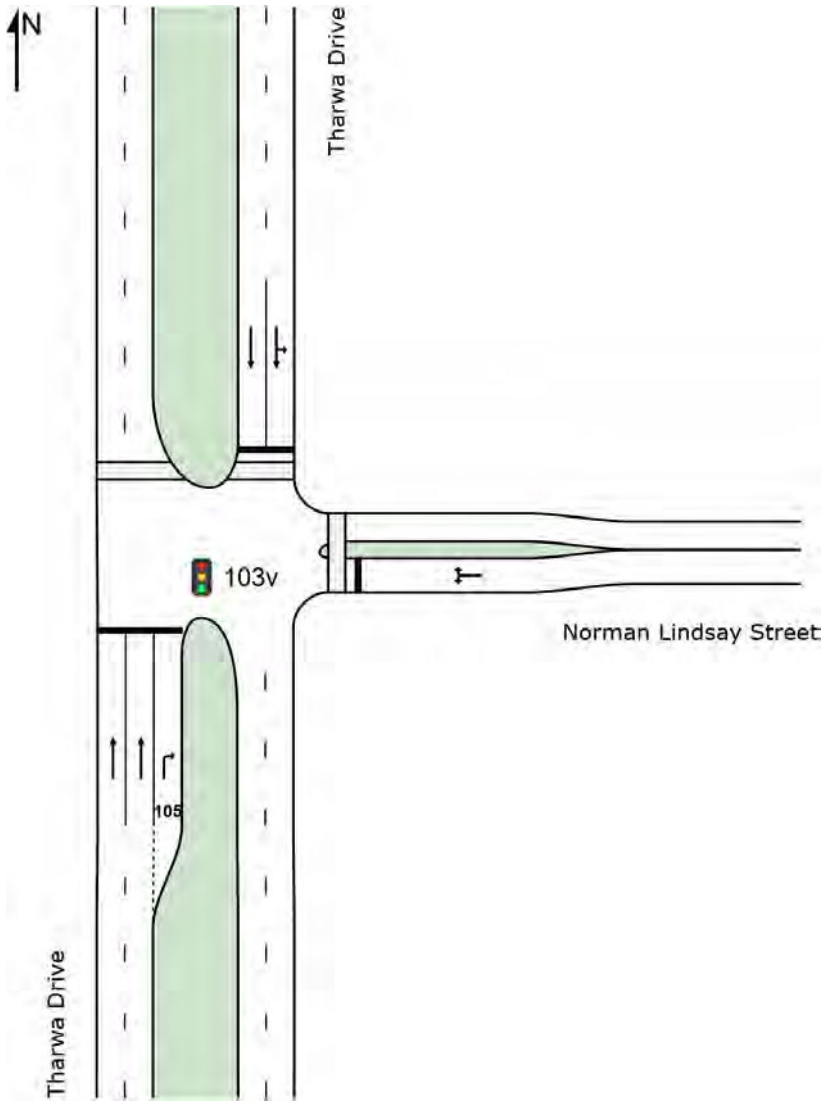
Site: 103v [2041_PM Peak_Tharwa Drive / Norman Lindsay Street - Upgraded]

Network: 9 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

Signalised T-Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	437	1.5	437	1.5	0.189	10.7	LOS A	3.4	24.2	0.62	0.53	0.62	47.1
3	R2	109	1.5	109	1.5	0.670	51.8	LOS D	3.1	21.7	1.00	0.82	1.09	26.1
Approach		546	1.5	546	1.5	0.670	18.9	LOS B	3.4	24.2	0.70	0.58	0.72	40.3
East: Norman Lindsay Street														
4	L2	203	1.5	203	1.5	0.663	35.7	LOS C	8.2	58.2	0.95	0.84	0.95	5.1
6	R2	134	1.5	134	1.5	0.663	35.6	LOS C	8.2	58.2	0.95	0.84	0.95	5.1
Approach		337	1.5	337	1.5	0.663	35.6	LOS C	8.2	58.2	0.95	0.84	0.95	5.1
North: Tharwa Drive														
7	L2	247	1.5	247	1.5	0.644	6.8	LOS A	1.3	9.0	0.09	0.33	0.09	13.7
8	T1	846	1.5	846	1.5	0.644	3.1	LOS A	3.7	26.5	0.21	0.27	0.21	43.7
Approach		1094	1.5	1094	1.5	0.644	3.9	LOS A	3.7	26.5	0.18	0.28	0.18	27.6
All Vehicles		1977	1.5	1977	1.5	0.670	13.5	LOS A	8.2	58.2	0.46	0.46	0.46	29.2

[redacted]

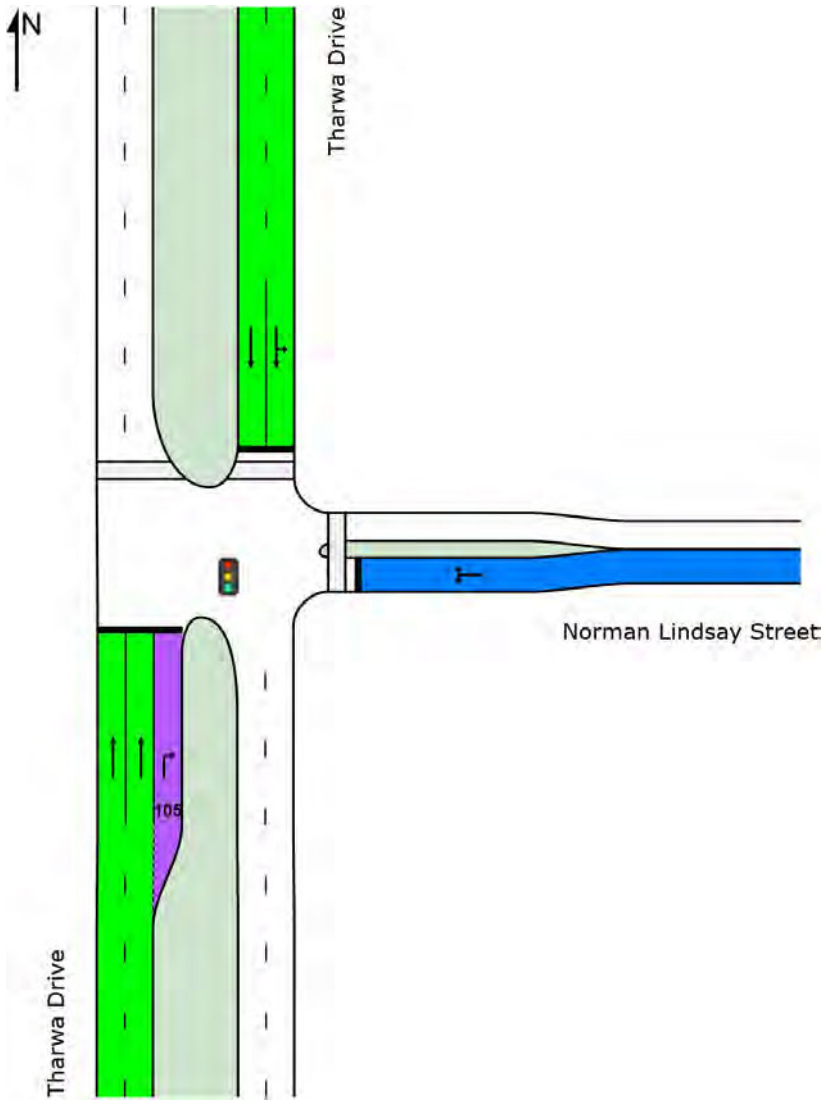
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	218	1.5	218	1.5	1159	0.189	100	10.6	LOS A	3.4	23.8	Full	640	0.0	0.0
Lane 2	218	1.5	218	1.5	1159	0.189	100	10.8	LOS A	3.4	24.2	Full	640	0.0	0.0
Lane 3	109	1.5	109	1.5	163	0.670	100	51.8	LOS D	3.1	21.7	Short	105	0.0	NA
Approach	546	1.5	546	1.5		0.670		18.9	LOS B	3.4	24.2				
East: Norman Lindsay Street															
Lane 1	337	1.5	337	1.5	508	0.663	100	35.6	LOS C	8.2	58.2	Full	40	0.0	86.1
Approach	337	1.5	337	1.5		0.663		35.6	LOS C	8.2	58.2				
North: Tharwa Drive															
Lane 1	541	1.5	541	1.5	839	0.644	100	3.8	LOS A	1.3	9.0	Full	165	0.0	0.0
Lane 2	553	1.5	553	1.5	858	0.644	100	4.0	LOS A	3.7	26.5	Full	165	0.0	0.0
Approach	1094	1.5	1094	1.5		0.644		3.9	LOS A	3.7	26.5				
Intersection	1977	1.5	1977	1.5		0.670		13.5	LOS A	8.2	58.2				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	B	C	A	A



Colour code based on Level of Service

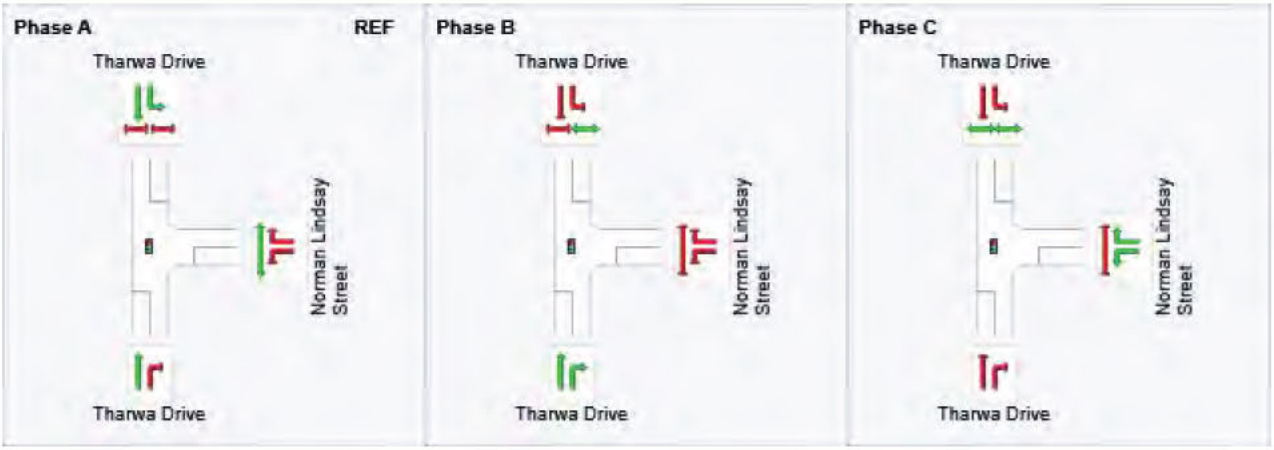
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

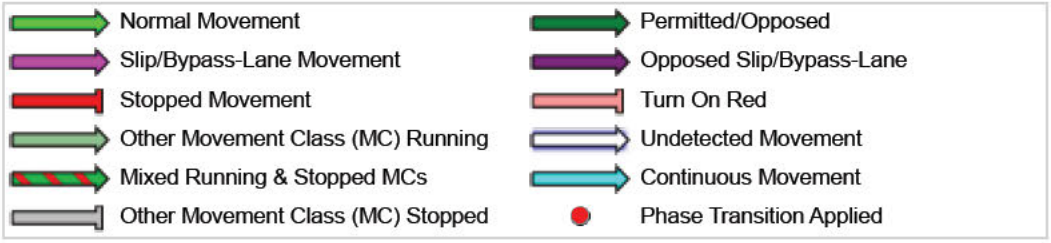
Phase	A	B	C
Phase Change Time (sec)	10	56	70
Green Time (sec)	40	8	24
Phase Time (sec)	46	14	30
Phase Split	51%	16%	33%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



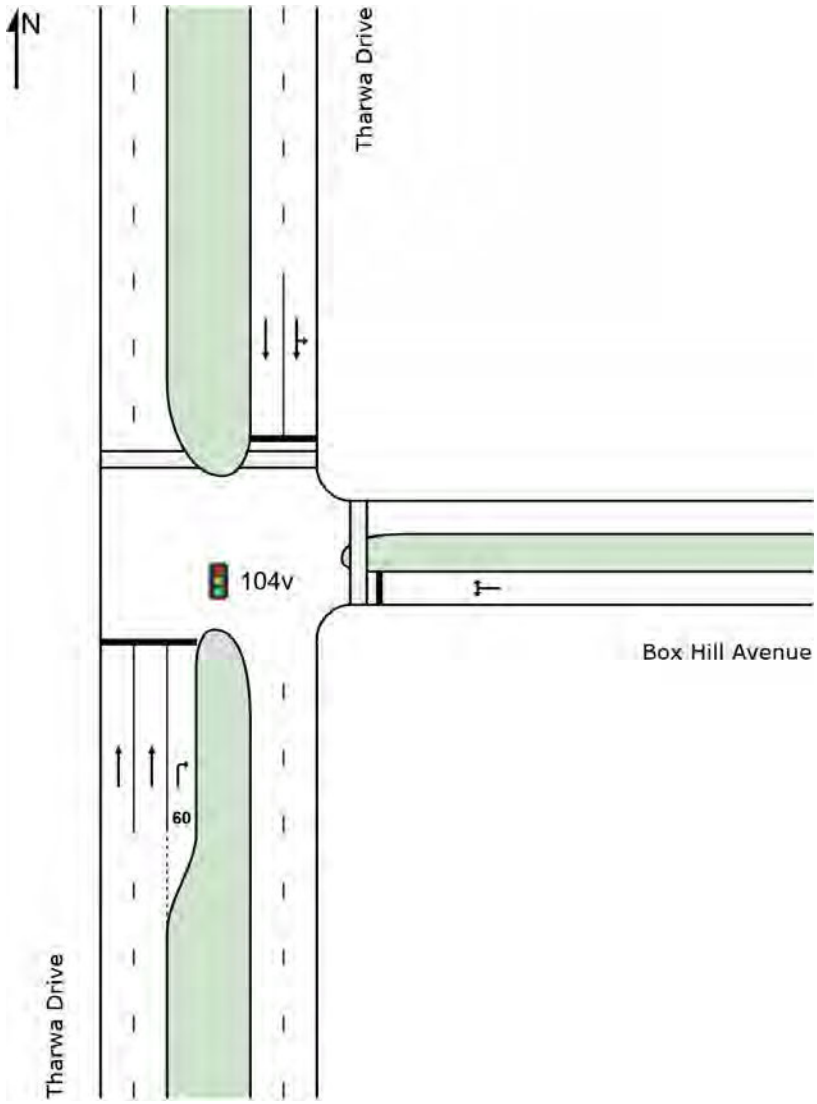
Site: 104v [2041_PM Peak_Tharwa Drive / Box Hill Avenue - Signals]

Network: 9 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

Signalised T-intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Sequence1
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	286	1.5	286	1.5	0.117	17.5	LOS B	3.5	24.6	0.94	0.78	0.94	46.5
3	R2	14	1.5	14	1.5	0.111	52.8	LOS D	0.4	2.7	1.00	0.69	1.00	33.0
Approach		300	1.5	300	1.5	0.117	19.1	LOS B	3.5	24.6	0.95	0.77	0.95	45.5
East: Box Hill Avenue														
4	L2	14	1.5	14	1.5	0.567	37.5	LOS C	6.6	46.6	0.92	0.82	0.92	9.7
6	R2	262	1.5	262	1.5	0.567	37.5	LOS C	6.6	46.6	0.92	0.82	0.92	9.7
Approach		276	1.5	276	1.5	0.567	37.5	LOS C	6.6	46.6	0.92	0.82	0.92	9.7
North: Tharwa Drive														
7	L2	486	1.5	486	1.5	0.564	22.8	LOS B	8.8	62.4	0.68	0.78	0.68	39.2
8	T1	567	1.5	567	1.5	0.564	3.3	LOS A	8.8	62.4	0.19	0.18	0.19	55.0
Approach		1054	1.5	1054	1.5	0.564	12.3	LOS A	8.8	62.4	0.42	0.46	0.42	45.8
All Vehicles		1629	1.5	1629	1.5	0.567	17.8	LOS B	8.8	62.4	0.60	0.58	0.60	41.0

[redacted]

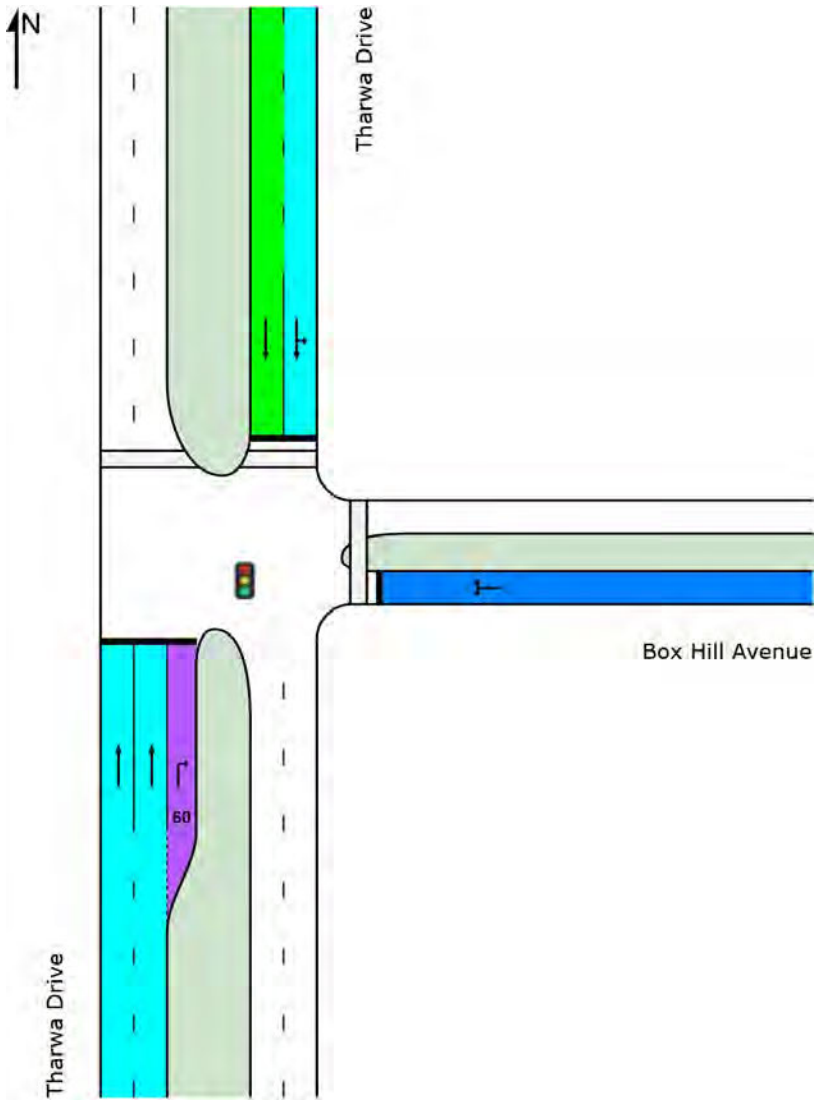
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	143	1.5	143	1.5	1223	0.117	100	16.9	LOS B	3.3	23.1	Full	990	0.0	0.0
Lane 2	143	1.5	143	1.5	1223	0.117	100	18.1	LOS B	3.5	24.6	Full	990	0.0	0.0
Lane 3	14	1.5	14	1.5	124	0.111	100	52.8	LOS D	0.4	2.7	Short	60	0.0	NA
Approach	300	1.5	300	1.5		0.117		19.1	LOS B	3.5	24.6				
East: Box Hill Avenue															
Lane 1	276	1.5	276	1.5	487	0.567	100	37.5	LOS C	6.6	46.6	Full	105	0.0	0.0
Approach	276	1.5	276	1.5		0.567		37.5	LOS C	6.6	46.6				
North: Tharwa Drive															
Lane 1	514	1.5	514	1.5	912	0.564	100	22.5	LOS B	8.8	62.4	Full	640	0.0	0.0
Lane 2	539	1.5	539	1.5	956	0.564	100	2.6	LOS A	2.3	16.0	Full	640	0.0	0.0
Approach	1054	1.5	1054	1.5		0.564		12.3	LOS A	8.8	62.4				
Intersection	1629	1.5	1629	1.5		0.567		17.8	LOS B	8.8	62.4				

[redacted]

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	B	C	A	B



Colour code based on Level of Service

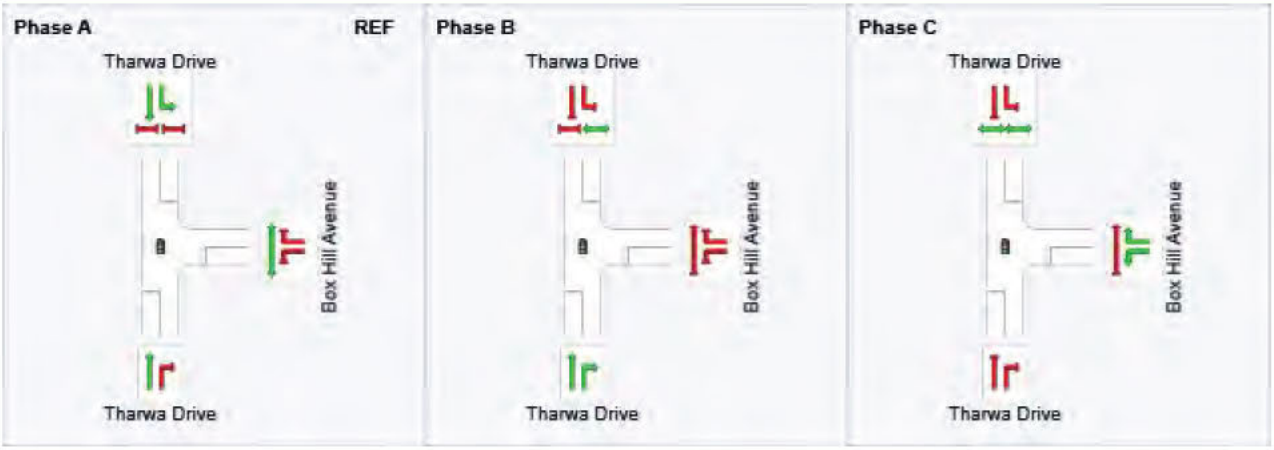
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Phase Timing Summary

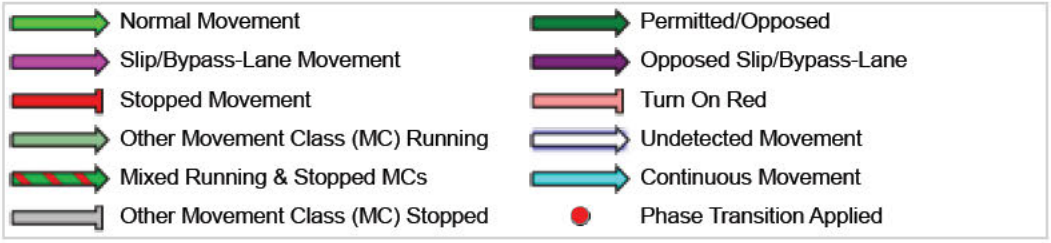
Phase	A	B	C
Phase Change Time (sec)	39	88	10
Green Time (sec)	43	6	23
Phase Time (sec)	49	12	29
Phase Split	54%	13%	32%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase



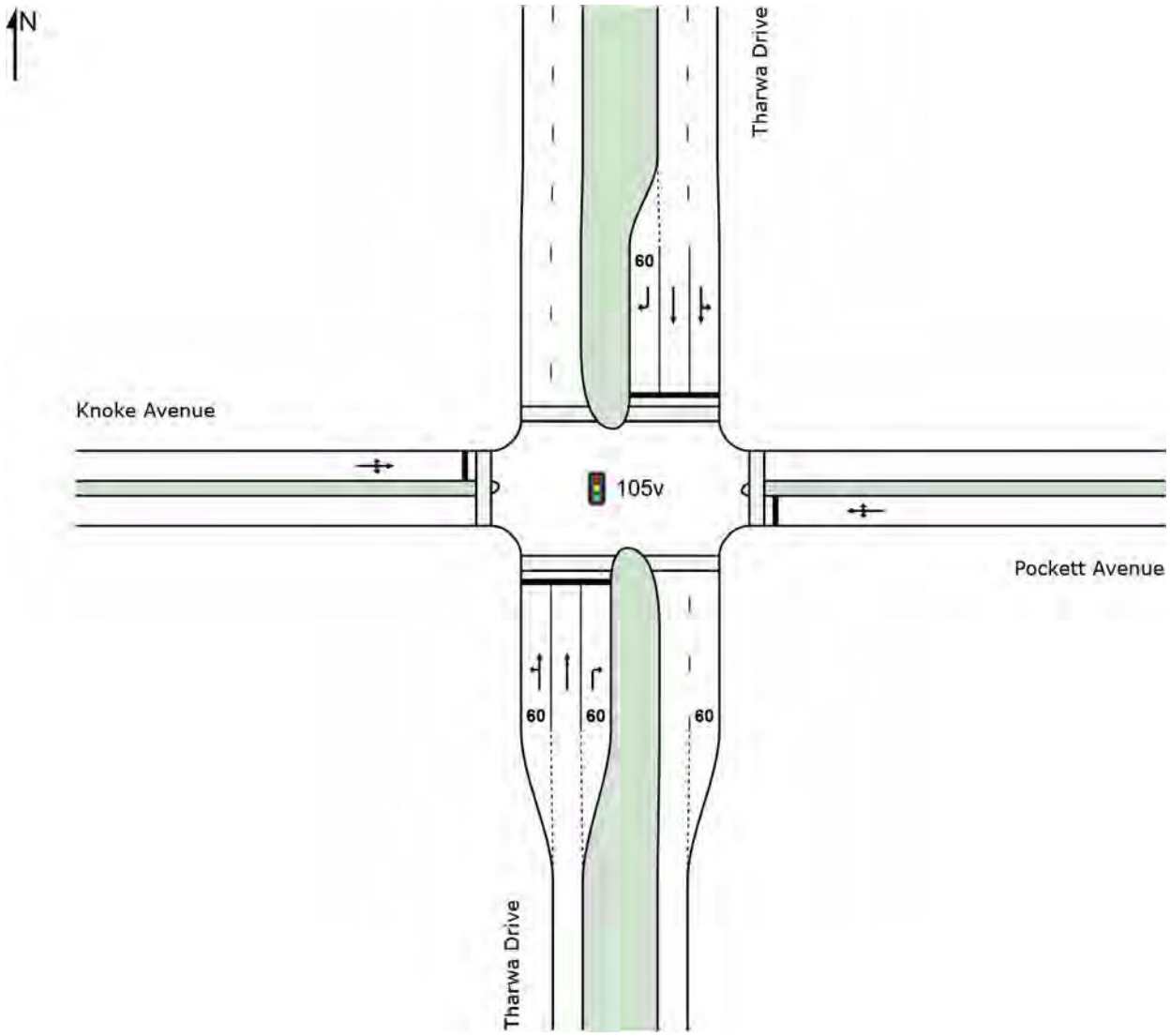
Site: 105v [2041_PM Peak_Tharwa Drive / Pockett Avenue - Signals]

Network: 9 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op3]

Signalised Intersection - Duplicated
Site Category: PM Peak 2041 Conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Network User-Given Cycle Time)

Timings based on settings in the Network Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Diamond Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.031	31.6	LOS C	0.3	2.3	0.77	0.56	0.77	17.4
2	T1	31	1.5	31	1.5	0.031	26.1	LOS B	0.3	2.3	0.77	0.55	0.77	32.3
3	R2	6	1.5	6	1.5	0.019	38.5	LOS C	0.1	1.0	0.85	0.65	0.85	27.9
Approach		39	1.5	39	1.5	0.031	28.4	LOS B	0.3	2.3	0.78	0.57	0.78	29.8
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.613	43.0	LOS D	5.4	38.0	0.97	0.81	0.97	27.0
5	T1	38	1.5	38	1.5	0.613	37.9	LOS C	5.4	38.0	0.97	0.81	0.97	13.1
6	R2	161	1.5	161	1.5	0.613	43.1	LOS D	5.4	38.0	0.97	0.81	0.97	7.5
Approach		209	1.5	209	1.5	0.613	42.1	LOS C	5.4	38.0	0.97	0.81	0.97	10.1
North: Tharwa Drive														
7	L2	309	1.5	309	1.5	0.609	37.2	LOS C	7.6	54.1	0.96	0.84	0.96	37.2
8	T1	62	1.5	62	1.5	0.116	27.6	LOS B	1.4	9.8	0.86	0.67	0.86	45.9
9	R2	211	1.5	211	1.5	0.622	37.3	LOS C	5.0	35.4	0.90	0.80	0.90	37.4
Approach		582	1.5	582	1.5	0.622	36.2	LOS C	7.6	54.1	0.93	0.81	0.93	38.3
West: Knoke Avenue														
10	L2	92	1.5	92	1.5	0.623	49.2	LOS D	3.6	25.8	1.00	0.82	1.05	7.5
11	T1	37	1.5	37	1.5	0.623	43.6	LOS D	3.6	25.8	1.00	0.82	1.05	11.7
12	R2	5	1.5	5	1.5	0.623	49.2	LOS D	3.6	25.8	1.00	0.82	1.05	25.7
Approach		134	1.5	134	1.5	0.623	47.7	LOS D	3.6	25.8	1.00	0.82	1.05	9.8
All Vehicles		964	1.5	964	1.5	0.623	38.8	LOS C	7.6	54.1	0.94	0.80	0.95	31.8

Lane Use and Performance

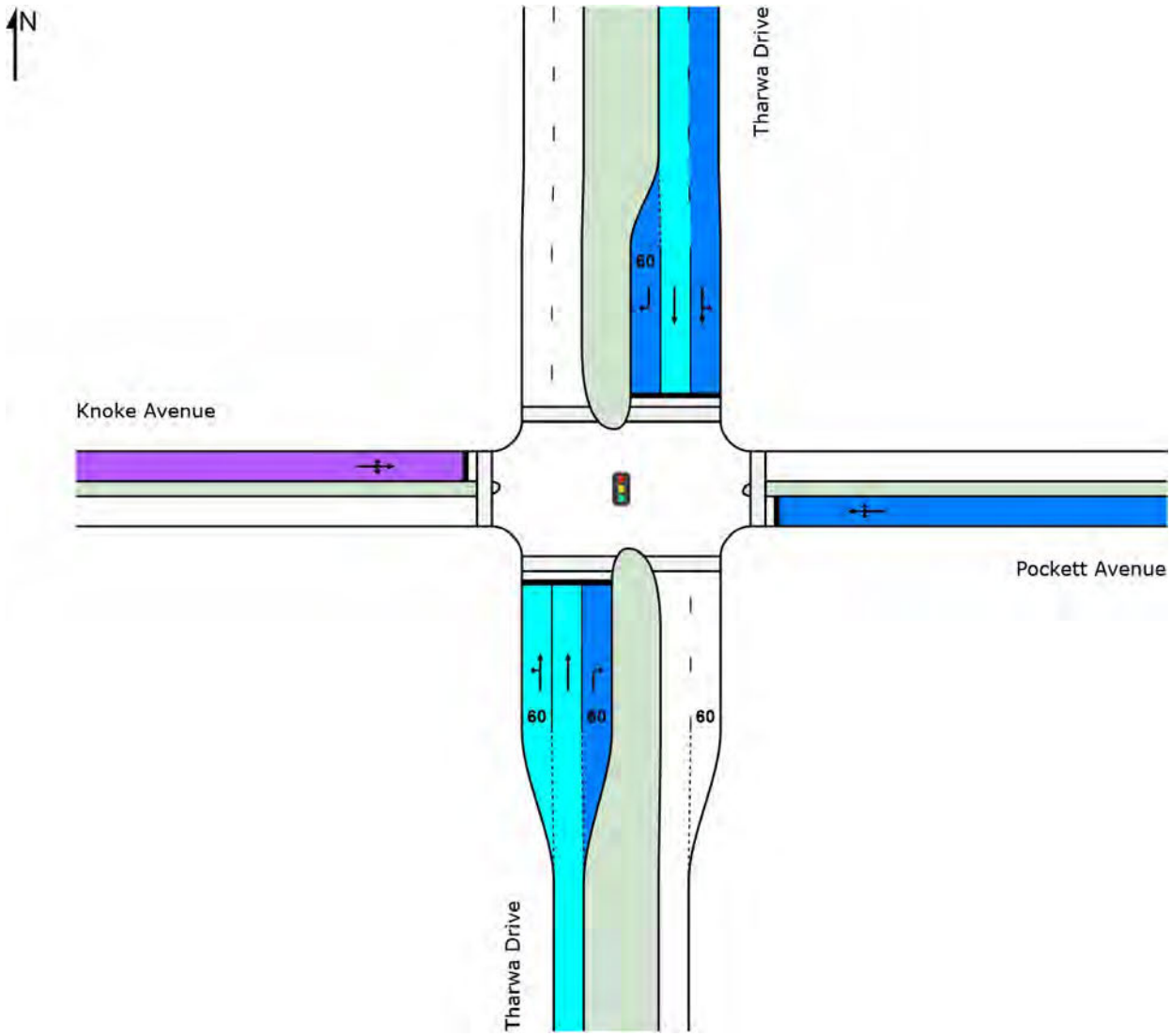
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	16	1.5	16	1.5	530	0.031	100	26.8	LOS B	0.3	2.3	Short	60	0.0	NA
Lane 2	16	1.5	16	1.5	534	0.031	100	26.1	LOS B	0.3	2.3	Full	500	0.0	0.0
Lane 3	6	1.5	6	1.5	339	0.019	100	38.5	LOS C	0.1	1.0	Short	60	0.0	NA
Approach	39	1.5	39	1.5		0.031		28.4	LOS B	0.3	2.3				
East: Pockett Avenue															
Lane 1	209	1.5	209	1.5	342	0.613	100	42.1	LOS C	5.4	38.0	Full	80	0.0	0.0
Approach	209	1.5	209	1.5		0.613		42.1	LOS C	5.4	38.0				
North: Tharwa Drive															
Lane 1	309	1.5	309	1.5	508	0.609	100	37.2	LOS C	7.6	54.1	Full	990	0.0	0.0
Lane 2	62	1.5	62	1.5	534	0.116	19[5]	27.6	LOS B	1.4	9.8	Full	990	0.0	0.0
Lane 3	211	1.5	211	1.5	339	0.622	100	37.3	LOS C	5.0	35.4	Short	60	0.0	NA
Approach	582	1.5	582	1.5		0.622		36.2	LOS C	7.6	54.1				
West: Knoke Avenue															
Lane 1	134	1.5	134	1.5	214	0.623	100	47.7	LOS D	3.6	25.8	Full	95	0.0	0.0
Approach	134	1.5	134	1.5		0.623		47.7	LOS D	3.6	25.8				
Intersection	964	1.5	964	1.5		0.623		38.8	LOS C	7.6	54.1				

[redacted]

5 Lane under-utilisation found by the program

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	D	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

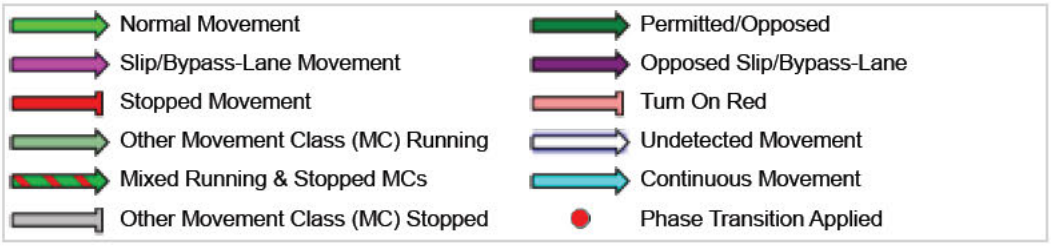
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	84	24	46	68
Green Time (sec)	24	16	16	10
Phase Time (sec)	30	22	22	16
Phase Split	33%	24%	24%	18%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase



DEGREE OF SATURATION

Ratio of Demand Volume to Capacity, v/c ratio per lane

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Degree of Saturation

[< 0.6]	[0.6 – 0.7]	[0.7 – 0.8]	[0.8 – 0.9]	[0.9 – 1.0]	[> 1.0]

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LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

Network: N101 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

2041 Future Conditions - Upgraded Layout
Network Category: (None)

Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Delay model settings are specified for individual Sites forming the Network.

USER REPORT FOR NETWORK SITE

Project: 2041 Conditions

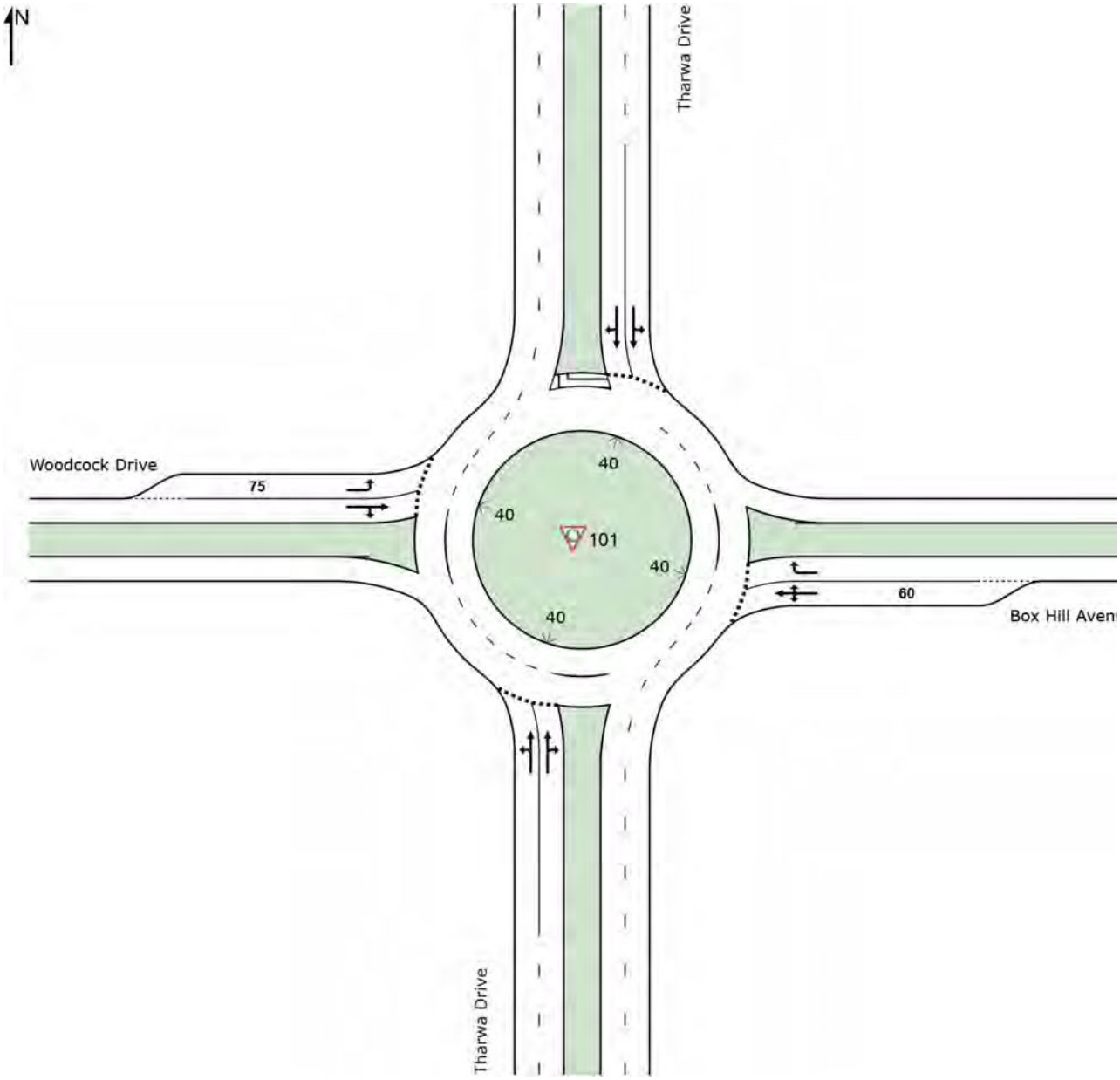
Template: Default Site User Report (2)

Site: 101 [2041_PM Peak_Tharwa Drive / Woodcock Drive - Duplicated w. Ped Xing]

Network: 11 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Two Lane Roundabout wight ped xing to south - Duplicated
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	154	1.5	154	1.5	0.310	4.7	LOS A	0.6	4.4	0.59	0.59	0.59	50.2
2	T1	408	1.5	408	1.5	0.310	4.8	LOS A	0.6	4.4	0.60	0.59	0.60	54.7
3	R2	9	1.5	9	1.5	0.310	11.2	LOS A	0.6	4.2	0.60	0.59	0.60	40.9
Approach		572	1.5	572	1.5	0.310	4.9	LOS A	0.6	4.4	0.60	0.59	0.60	53.5
East: Box Hill Avenue														
4	L2	33	1.5	33	1.5	0.471	8.3	LOS A	1.4	9.8	0.87	0.96	1.00	31.2
5	T1	108	1.5	108	1.5	0.471	8.2	LOS A	1.4	9.8	0.87	0.96	1.00	47.3
6	R2	501	1.5	501	1.5	0.471	15.4	LOS B	1.4	9.8	0.86	0.98	1.01	48.0
Approach		642	1.5	642	1.5	0.471	13.8	LOS A	1.4	9.8	0.86	0.98	1.00	47.5
North: Tharwa Drive														
7	L2	814	1.5	814	1.5	0.685	4.5	LOS A	3.0	21.1	0.68	0.53	0.68	51.9
8	T1	993	1.5	993	1.5	0.685	4.6	LOS A	3.0	21.4	0.72	0.54	0.73	48.5
9	R2	116	1.5	116	1.5	0.685	11.7	LOS A	3.0	21.4	0.73	0.55	0.75	55.5
Approach		1922	1.5	1922	1.5	0.685	5.0	LOS A	3.0	21.4	0.70	0.54	0.71	50.6
West: Woodcock Drive														
10	L2	67	1.5	67	1.5	0.095	6.1	LOS A	0.2	1.1	0.60	0.71	0.60	54.1
11	T1	151	1.5	151	1.5	0.211	4.5	LOS A	0.4	2.9	0.62	0.60	0.62	52.0
12	R2	68	1.5	68	1.5	0.211	11.5	LOS A	0.4	2.9	0.62	0.60	0.62	45.9
Approach		286	1.5	286	1.5	0.211	6.6	LOS A	0.4	2.9	0.62	0.63	0.62	51.5
All Vehicles		3422	1.5	3422	1.5	0.685	6.8	LOS A	3.0	21.4	0.71	0.64	0.74	50.4

[redacted]

Lane Use and Performance

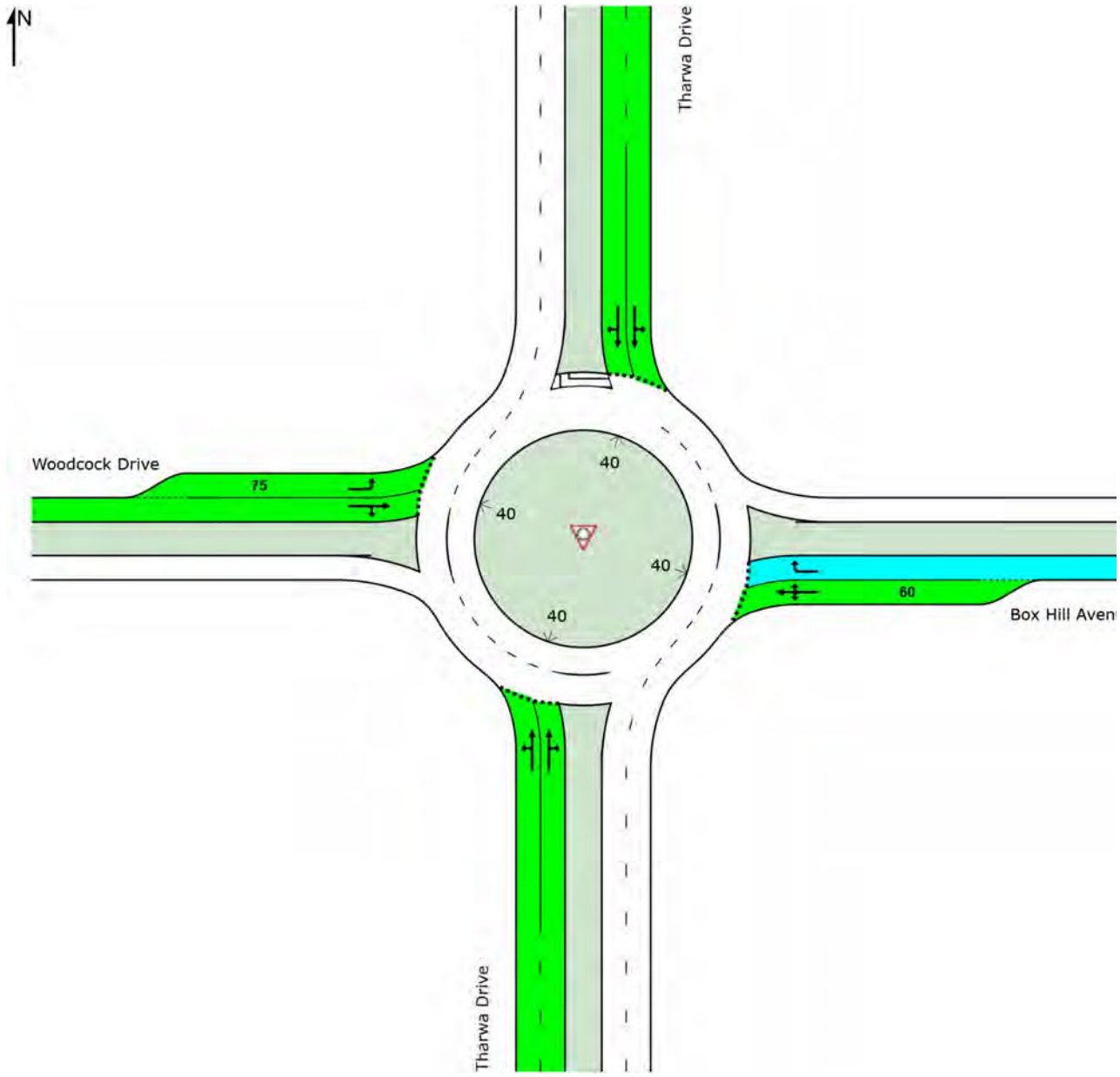
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	314	1.5	314	1.5	1014	0.310	100	4.6	LOS A	0.6	4.4	Full	75	0.0	0.0
Lane 2	258	1.5	258	1.5	832	0.310	100	5.3	LOS A	0.6	4.2	Full	75	0.0	0.0
Approach	572	1.5	572	1.5		0.310		4.9	LOS A	0.6	4.4				
East: Box Hill Avenue															
Lane 1[d]	367	1.5	367	1.5	779	0.471	100	12.1	LOS A	1.4	9.8	Short	60	0.0	NA
Lane 2	275	1.5	275	1.5	585	0.471	100	16.1	LOS B	1.2	8.8	Full	150	0.0	0.0
Approach	642	1.5	642	1.5		0.471		13.8	LOS A	1.4	9.8				
North: Tharwa Drive															
Lane 1[d]	1066	1.5	1066	1.5	1556	0.685	100	4.4	LOS A	3.0	21.1	Full	490	0.0	0.0
Lane 2	857	1.5	857	1.5	1251	0.685	100	5.7	LOS A	3.0	21.4	Full	490	0.0	0.0
Approach	1922	1.5	1922	1.5		0.685		5.0	LOS A	3.0	21.4				
West: Woodcock Drive															
Lane 1	67	1.5	67	1.5	709	0.095	100	6.1	LOS A	0.2	1.1	Short	75	0.0	NA
Lane 2[d]	219	1.5	219	1.5	1037	0.211	100	6.7	LOS A	0.4	2.9	Full	380	0.0	0.0
Approach	286	1.5	286	1.5		0.211		6.6	LOS A	0.4	2.9				
Intersection	3422	1.5	3422	1.5		0.685		6.8	LOS A	3.0	21.4				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

[redacted]

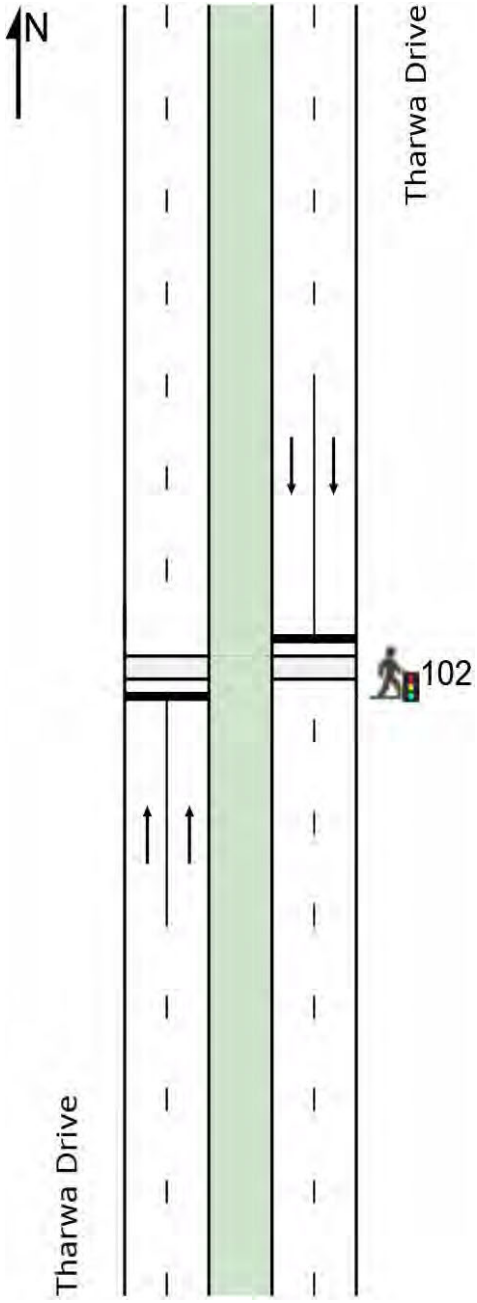
Site: 102 [2041_PM Peak_Tharwa Drive Pedestrian Crossing - Widened]

Network: 11 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Pedestrian Crossing - Duplicated
Site Category: PM Peak 2041 Conditions
Pedestrian Crossing (Signals) - Fixed Time Isolated Cycle Time = 75 seconds (Site User-Given Cycle Time)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Downstream lane blockage effects included in determining phase times
Phase Sequence: Two-Phase
Reference Phase: Phase A
Input Phase Sequence: A, B
Output Phase Sequence: A, B

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	572	1.5	572	1.5	0.185	2.4	LOS A	1.7	11.8	0.28	0.24	0.28	41.7
Approach		572	1.5	572	1.5	0.185	2.4	LOS A	1.7	11.8	0.28	0.24	0.28	41.7
North: Tharwa Drive														
8	T1	1093	1.5	1093	1.5	0.353	2.8	LOS A	3.8	26.7	0.34	0.30	0.34	38.7
Approach		1093	1.5	1093	1.5	0.353	2.8	LOS A	3.8	26.7	0.34	0.30	0.34	38.7
All Vehicles		1664	1.5	1664	1.5	0.353	2.7	LOS A	3.8	26.7	0.32	0.28	0.32	39.7

[redacted]

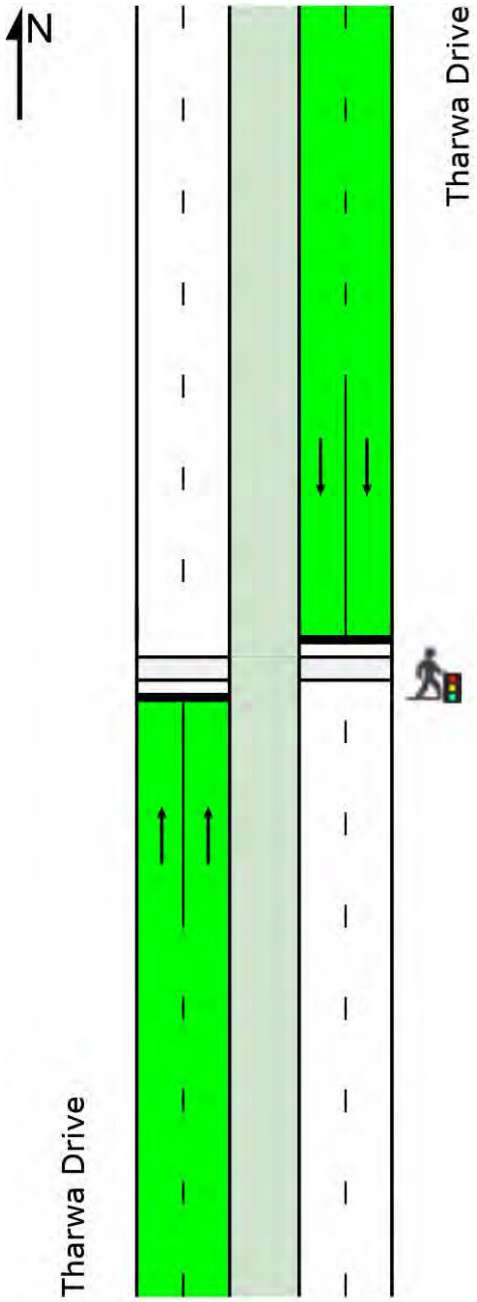
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1	286	1.5	286	1.5	1548	0.185	100	2.4	LOS A	1.7	11.8	Full	80	0.0	0.0
Lane 2	286	1.5	286	1.5	1548	0.185	100	2.4	LOS A	1.7	11.8	Full	80	0.0	0.0
Approach	572	1.5	572	1.5		0.185		2.4	LOS A	1.7	11.8				
North: Tharwa Drive															
Lane 1	546	1.5	546	1.5	1548	0.353	100	2.8	LOS A	3.8	26.7	Full	75	0.0	0.0
Lane 2	546	1.5	546	1.5	1548	0.353	100	2.8	LOS A	3.8	26.7	Full	75	0.0	0.0
Approach	1093	1.5	1093	1.5		0.353		2.8	LOS A	3.8	26.7				
Intersection	1664	1.5	1664	1.5		0.353		2.7	LOS A	3.8	26.7				

[redacted]

Lane Level of Service

	Approaches		Intersection
	South	North	
LOS	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

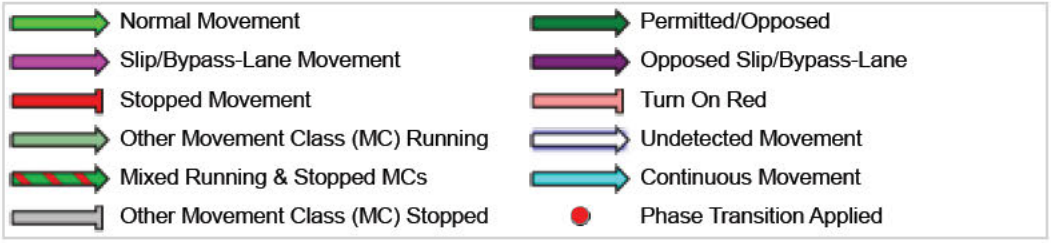
Phase Timing Summary

Phase	A	B
Phase Change Time (sec)	0	64
Green Time (sec)	58	7
Phase Time (sec)	62	13
Phase Split	83%	17%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence

REF: Reference Phase
VAR: Variable Phase

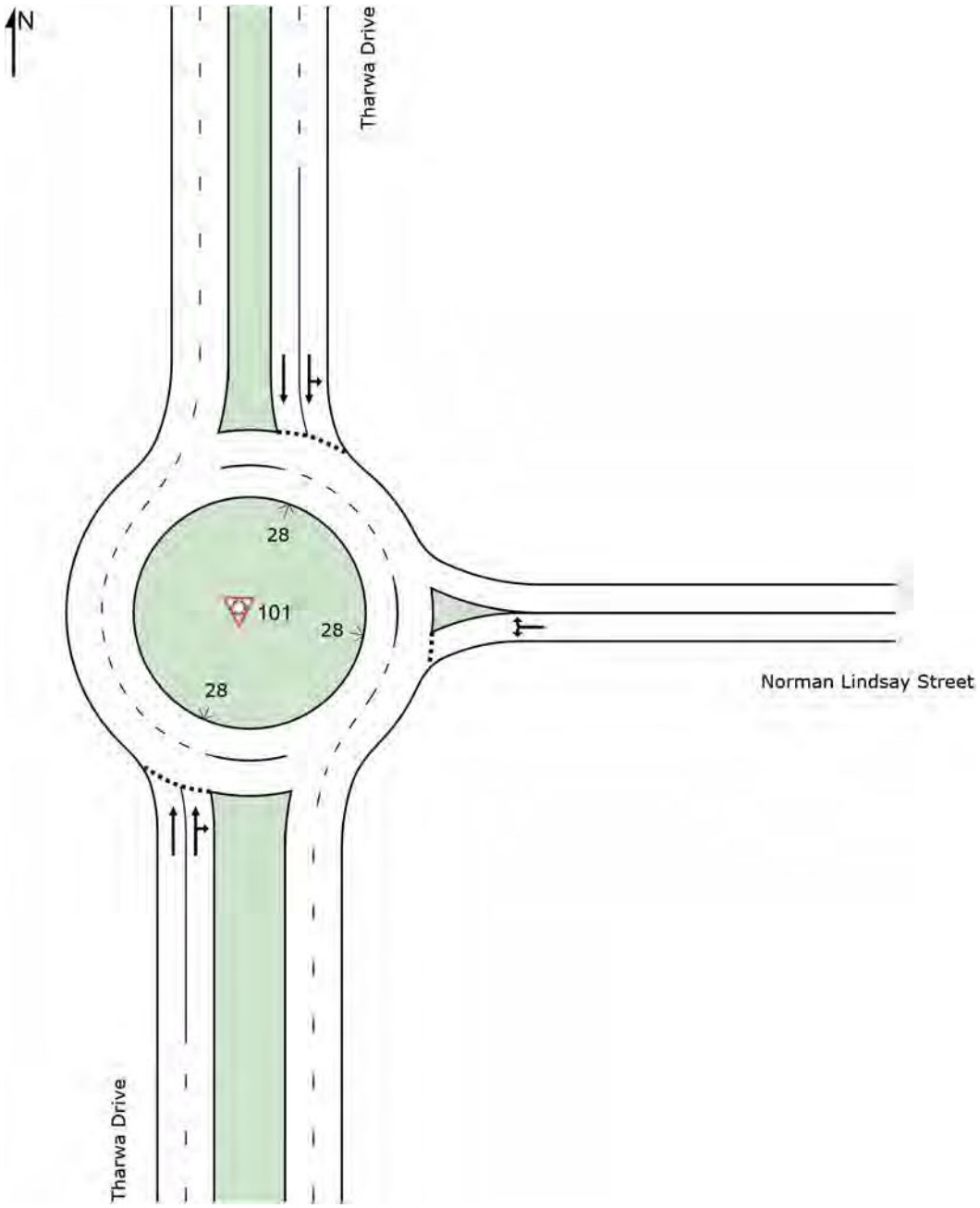


Site: 101 [2041_PM Peak_Tharwa Drive / Norman Lindsay Street - Roundabout]

Network: 11 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Dual Lane Roundabout
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	437	1.5	437	1.5	0.206	4.1	LOS A	0.5	3.2	0.31	0.45	0.31	52.1
3	R2	109	1.5	109	1.5	0.206	9.7	LOS A	0.4	3.2	0.31	0.52	0.31	49.6
Approach		546	1.5	546	1.5	0.206	5.2	LOS A	0.5	3.2	0.31	0.46	0.31	51.5
East: Norman Lindsay Street														
4	L2	203	1.5	203	1.5	0.404	5.6	LOS A	0.9	6.2	0.67	0.86	0.71	23.0
6	R2	134	1.5	134	1.5	0.404	10.8	LOS A	0.9	6.2	0.67	0.86	0.71	23.0
Approach		337	1.5	337	1.5	0.404	7.7	LOS A	0.9	6.2	0.67	0.86	0.71	23.0
North: Tharwa Drive														
7	L2	247	1.5	247	1.5	0.413	3.7	LOS A	0.9	6.1	0.26	0.42	0.26	15.0
8	T1	846	1.5	846	1.5	0.413	3.8	LOS A	0.9	6.1	0.27	0.41	0.27	36.1
Approach		1094	1.5	1094	1.5	0.413	3.8	LOS A	0.9	6.1	0.27	0.42	0.27	26.2
All Vehicles		1977	1.5	1977	1.5	0.413	4.8	LOS A	0.9	6.2	0.35	0.50	0.35	39.4

[redacted]

Lane Use and Performance

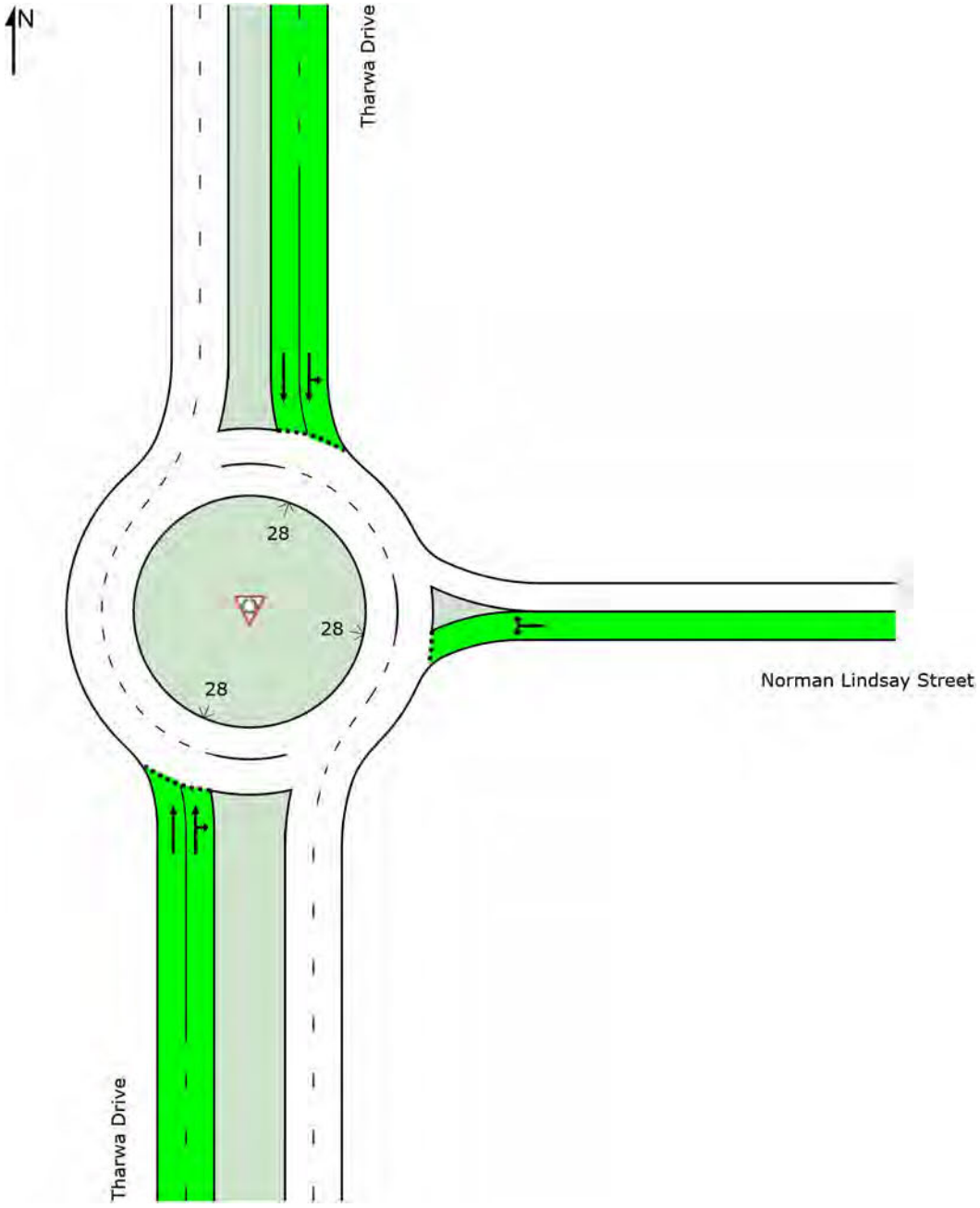
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	285	1.5	285	1.5	1381	0.206	100	4.1	LOS A	0.5	3.2	Full	640	0.0	0.0
Lane 2	261	1.5	261	1.5	1268	0.206	100	6.5	LOS A	0.4	3.2	Full	640	0.0	0.0
Approach	546	1.5	546	1.5		0.206		5.2	LOS A	0.5	3.2				
East: Norman Lindsay Street															
Lane 1[d]	337	1.5	337	1.5	833	0.404	100	7.7	LOS A	0.9	6.2	Full	40	0.0	0.0
Approach	337	1.5	337	1.5		0.404		7.7	LOS A	0.9	6.2				
North: Tharwa Drive															
Lane 1[d]	575	1.5	575	1.5	1393	0.413	100	3.7	LOS A	0.9	6.1	Full	80	0.0	0.0
Lane 2	519	1.5	519	1.5	1256	0.413	100	3.8	LOS A	0.9	6.1	Full	80	0.0	0.0
Approach	1094	1.5	1094	1.5		0.413		3.8	LOS A	0.9	6.1				
Intersection	1977	1.5	1977	1.5		0.413		4.8	LOS A	0.9	6.2				

[redacted]

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

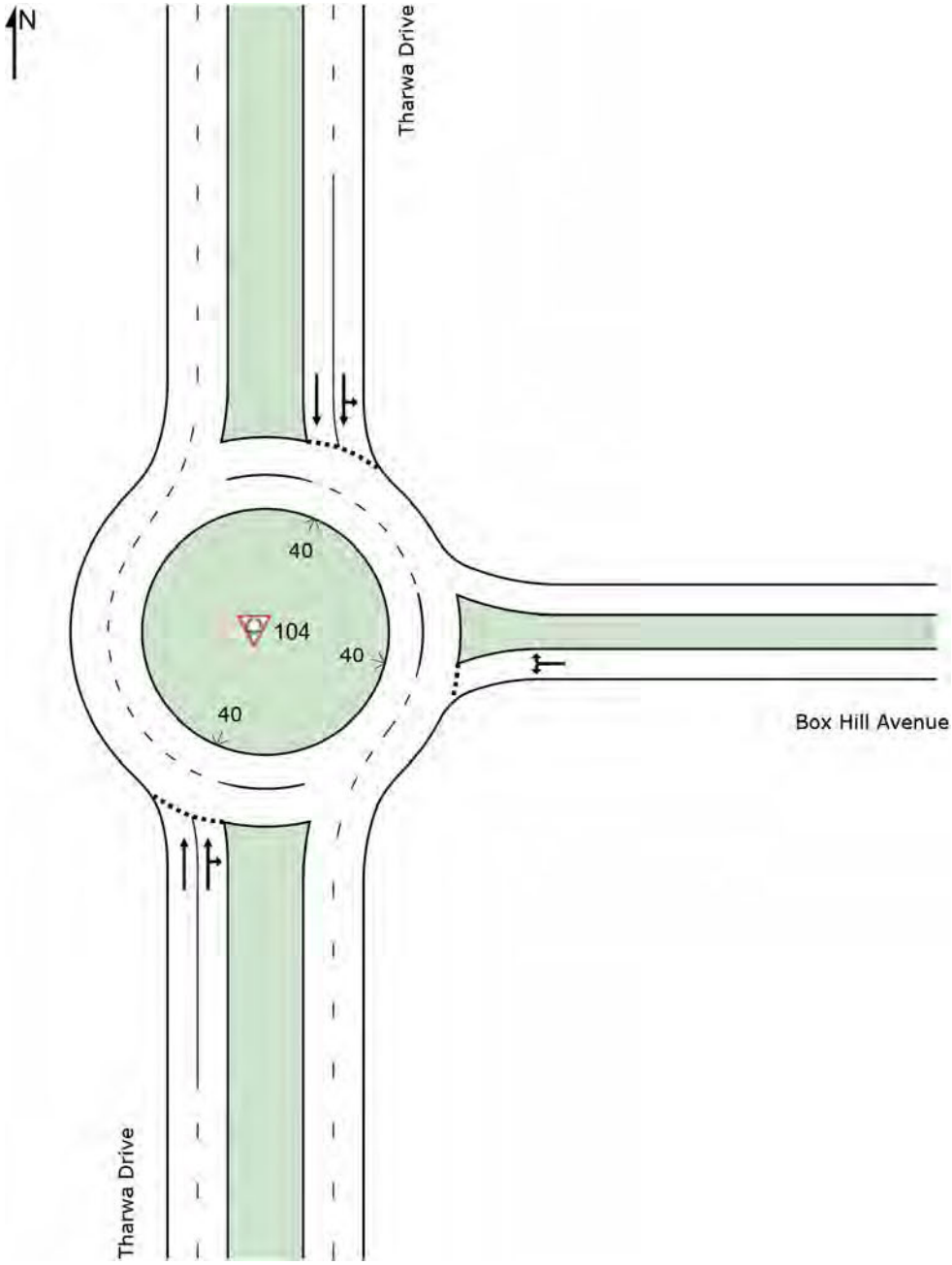
LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site: 104 [2041_PM Peak_Tharwa Drive / Box Hill Avenue - Roundabout]

Network: 11 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Dual Lane Roundabout - Duplicated
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
2	T1	286	1.5	286	1.5	0.122	3.6	LOS A	0.2	1.8	0.39	0.39	0.39	55.0
3	R2	14	1.5	14	1.5	0.122	10.4	LOS A	0.2	1.7	0.40	0.42	0.40	54.0
Approach		300	1.5	300	1.5	0.122	3.9	LOS A	0.2	1.8	0.39	0.39	0.39	55.0
East: Box Hill Avenue														
4	L2	14	1.5	14	1.5	0.287	5.4	LOS A	0.5	3.8	0.54	0.77	0.54	29.7
6	R2	262	1.5	262	1.5	0.287	11.7	LOS A	0.5	3.8	0.54	0.77	0.54	29.7
Approach		276	1.5	276	1.5	0.287	11.4	LOS A	0.5	3.8	0.54	0.77	0.54	29.7
North: Tharwa Drive														
7	L2	486	1.5	486	1.5	0.324	3.2	LOS A	0.8	5.5	0.08	0.37	0.08	55.9
8	T1	567	1.5	567	1.5	0.324	2.8	LOS A	0.8	5.5	0.09	0.29	0.09	55.5
Approach		1054	1.5	1054	1.5	0.324	3.0	LOS A	0.8	5.5	0.09	0.33	0.09	55.7
All Vehicles		1629	1.5	1629	1.5	0.324	4.6	LOS A	0.8	5.5	0.22	0.41	0.22	53.3

[redacted]

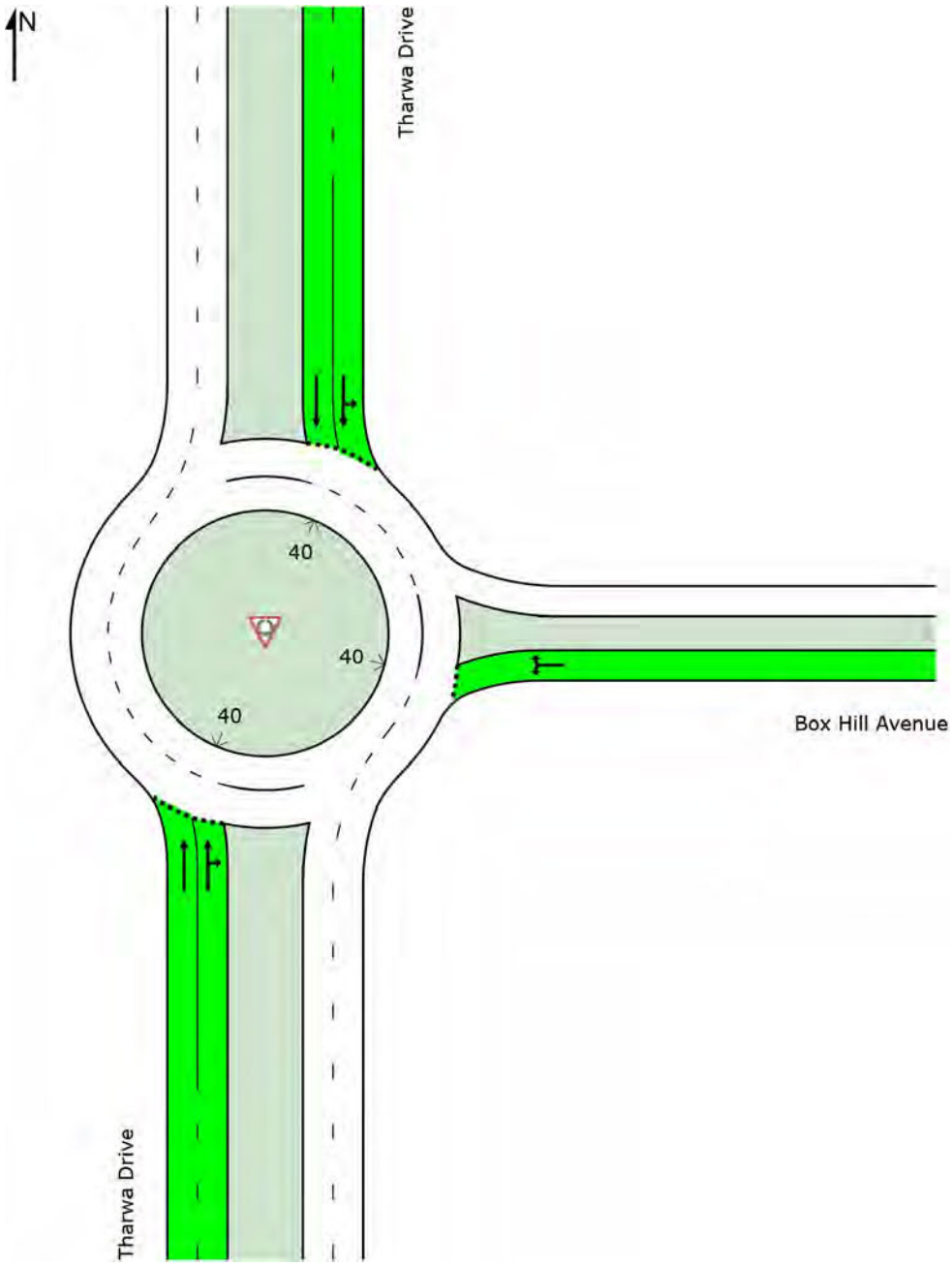
Lane Use and Performance

	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	159	1.5	159	1.5	1302	0.122	100	3.5	LOS A	0.2	1.8	Full	990	0.0	0.0
Lane 2	141	1.5	141	1.5	1161	0.122	100	4.3	LOS A	0.2	1.7	Full	990	0.0	0.0
Approach	300	1.5	300	1.5		0.122		3.9	LOS A	0.2	1.8				
East: Box Hill Avenue															
Lane 1[d]	276	1.5	276	1.5	960	0.287	100	11.4	LOS A	0.5	3.8	Full	105	0.0	0.0
Approach	276	1.5	276	1.5		0.287		11.4	LOS A	0.5	3.8				
North: Tharwa Drive															
Lane 1[d]	565	1.5	565	1.5	1743	0.324	100	3.2	LOS A	0.8	5.5	Full	640	0.0	0.0
Lane 2	488	1.5	488	1.5	1506	0.324	100	2.8	LOS A	0.8	5.4	Full	640	0.0	0.0
Approach	1054	1.5	1054	1.5		0.324		3.0	LOS A	0.8	5.5				
Intersection	1629	1.5	1629	1.5		0.324		4.6	LOS A	0.8	5.5				

d Dominant lane on roundabout approach

Lane Level of Service

	Approaches			Intersection
	South	East	North	
LOS	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

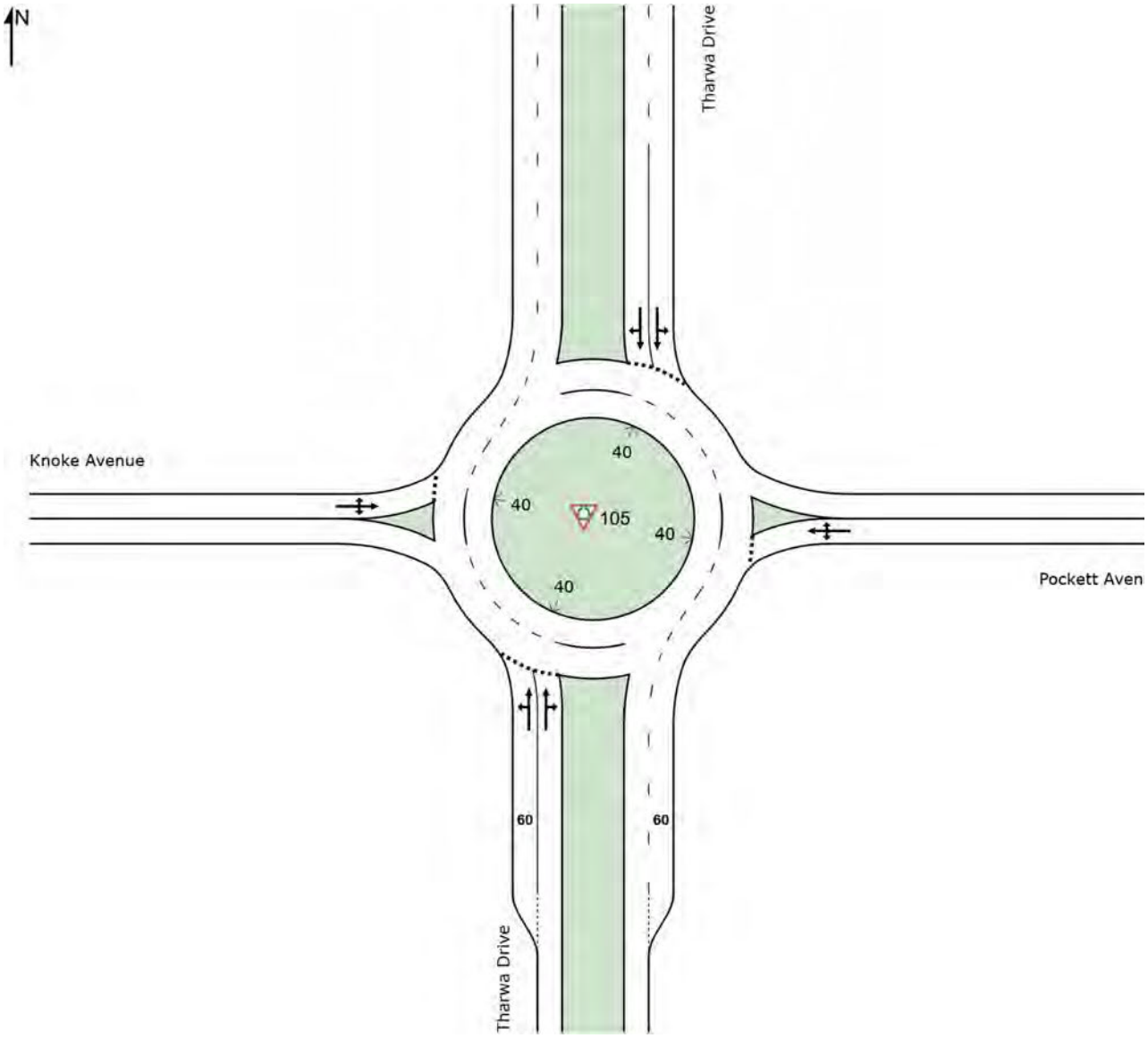
[redacted]

Site: 105 [2041_PM Peak_Tharwa Drive / Pockett Avenue - Roundabout]

Network: 11 [2041 Future Conditions with Upgrades_Tharwa Drive PM peak - Op4]

Dual Lane Roundabout - Duplicated
Site Category: PM Peak 2041 Conditions
Roundabout

Site Layout



Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Tharwa Drive														
1	L2	2	1.5	2	1.5	0.017	4.4	LOS A	0.0	0.2	0.42	0.41	0.42	52.7
2	T1	31	1.5	31	1.5	0.017	4.0	LOS A	0.0	0.2	0.42	0.45	0.42	50.5
3	R2	6	1.5	6	1.5	0.017	10.8	LOS A	0.0	0.2	0.43	0.51	0.43	48.4
Approach		39	1.5	39	1.5	0.017	5.1	LOS A	0.0	0.2	0.42	0.46	0.42	50.2
East: Pockett Avenue														
4	L2	11	1.5	11	1.5	0.190	3.8	LOS A	0.4	2.5	0.40	0.64	0.40	49.0
5	T1	38	1.5	38	1.5	0.190	3.6	LOS A	0.4	2.5	0.40	0.64	0.40	14.7
6	R2	161	1.5	161	1.5	0.190	10.1	LOS A	0.4	2.5	0.40	0.64	0.40	30.8
Approach		209	1.5	209	1.5	0.190	8.6	LOS A	0.4	2.5	0.40	0.64	0.40	25.9
North: Tharwa Drive														
7	L2	309	1.5	309	1.5	0.193	3.3	LOS A	0.4	2.7	0.15	0.39	0.15	55.8
8	T1	62	1.5	62	1.5	0.192	2.9	LOS A	0.4	2.6	0.16	0.56	0.16	56.5
9	R2	211	1.5	211	1.5	0.192	9.6	LOS A	0.4	2.6	0.16	0.56	0.16	44.0
Approach		582	1.5	582	1.5	0.193	5.6	LOS A	0.4	2.7	0.15	0.47	0.15	50.9
West: Knoke Avenue														
10	L2	92	1.5	92	1.5	0.116	3.7	LOS A	0.2	1.4	0.32	0.44	0.32	37.0
11	T1	37	1.5	37	1.5	0.116	3.4	LOS A	0.2	1.4	0.32	0.44	0.32	28.7
12	R2	5	1.5	5	1.5	0.116	10.1	LOS A	0.2	1.4	0.32	0.44	0.32	58.2
Approach		134	1.5	134	1.5	0.116	3.8	LOS A	0.2	1.4	0.32	0.44	0.32	35.4
All Vehicles		964	1.5	964	1.5	0.193	6.0	LOS A	0.4	2.7	0.24	0.50	0.24	47.7

[redacted]

Lane Use and Performance

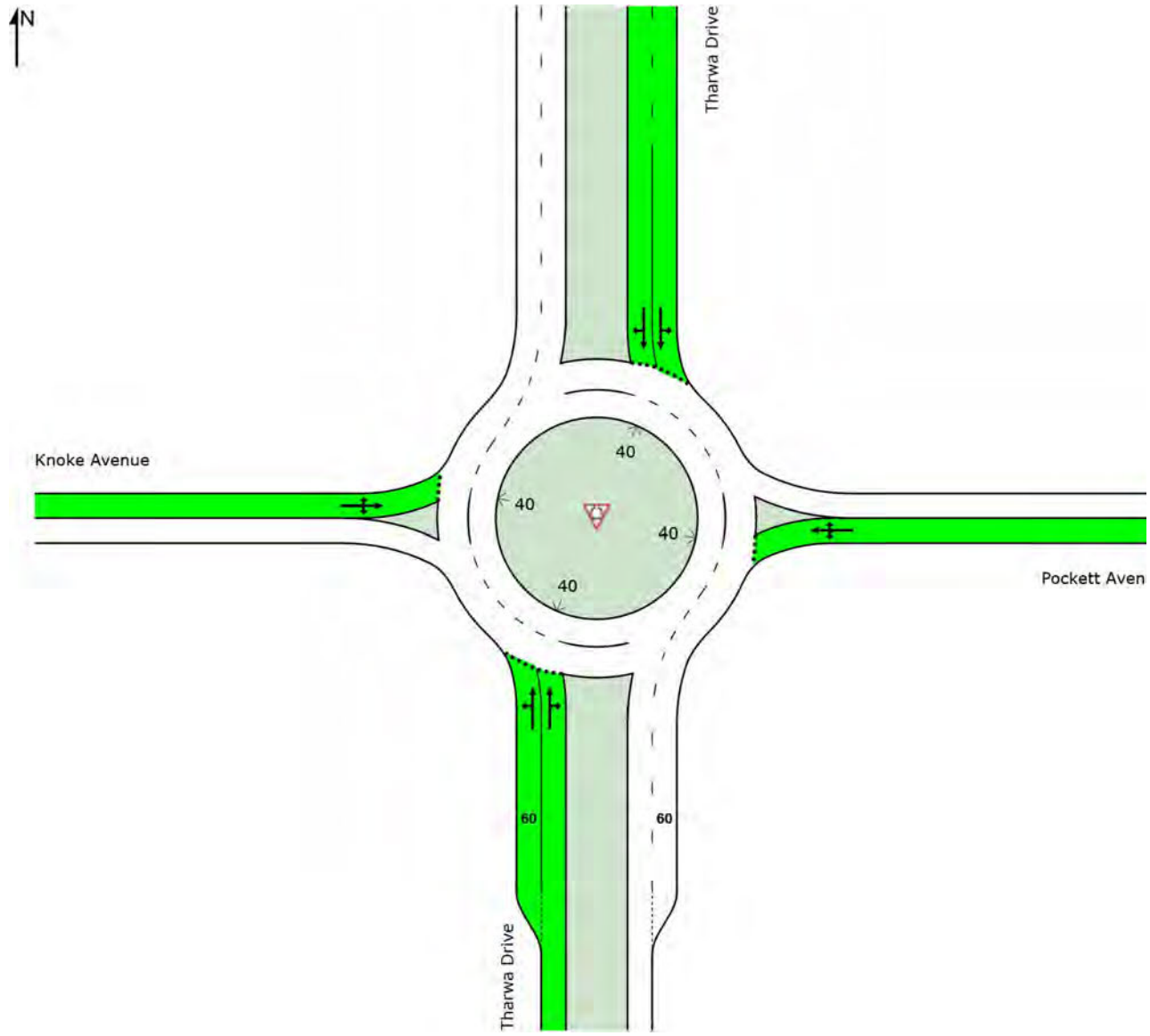
	Demand Flows		Arrival Flows		Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	Aver. Back of Queue		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	Total veh/h	HV %	Total veh/h	HV %	veh/h	v/c	%	sec		Veh	Dist m		m	%	%
South: Tharwa Drive															
Lane 1[d]	21	1.5	21	1.5	1228	0.017	100	4.0	LOS A	0.0	0.2	Short	60	0.0	NA
Lane 2	18	1.5	18	1.5	1072	0.017	100	6.5	LOS A	0.0	0.2	Full	500	0.0	0.0
Approach	39	1.5	39	1.5		0.017		5.1	LOS A	0.0	0.2				
East: Pockett Avenue															
Lane 1[d]	209	1.5	209	1.5	1102	0.190	100	8.6	LOS A	0.4	2.5	Full	80	0.0	0.0
Approach	209	1.5	209	1.5		0.190		8.6	LOS A	0.4	2.5				
North: Tharwa Drive															
Lane 1[d]	309	1.5	309	1.5	1600	0.193	100	3.3	LOS A	0.4	2.7	Full	990	0.0	0.0
Lane 2	273	1.5	273	1.5	1418	0.192	99[5]	8.1	LOS A	0.4	2.6	Full	990	0.0	0.0
Approach	582	1.5	582	1.5		0.193		5.6	LOS A	0.4	2.7				
West: Knoke Avenue															
Lane 1[d]	134	1.5	134	1.5	1157	0.116	100	3.8	LOS A	0.2	1.4	Full	95	0.0	0.0
Approach	134	1.5	134	1.5		0.116		3.8	LOS A	0.2	1.4				
Intersection	964	1.5	964	1.5		0.193		6.0	LOS A	0.4	2.7				

[redacted]

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach

Lane Level of Service

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

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Appendix D Environmental Assessment

lanterra consulting

Preliminary Site Investigation

Tharwa Drive, Gordon

Calibre Group

9 December 2020

Author	[redacted]
Reviewer	
Approver	
Report Reference	P20103_PSI Tharwa Drive_20201209
Date	9/12/2020
Revision Text	R02

This report has been prepared for Calibre Group in accordance with the terms and conditions of appointment for Q20091 (31 August 2020). Lanterra Consulting Pty Ltd cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared	Approved
R00	12/11/2020	Draft for Review	[redacted]	[redacted]
R01	13/11/2020	Final	[redacted]	
R02	09/12/2020	Final – minor revision	[redacted]	

Lanterra Consulting Pty Limited

4/19 Trenerry Street, Weston ACT 2611

ABN: 30 629 182 823

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Appendix C Lotsearch Environmental Risk Report
Appendix D ACT EPA Contaminated Land Search

Executive Summary

Calibre Group (the Client) engaged Lanterra Consulting Pty Ltd (Lanterra) to complete a Preliminary Site Investigation (PSI) for the proposed Tharwa Drive duplication between Woodcock Drive and Pockett Avenue, Gordon ACT 2906 as shown in **Appendix A, Figure 2** (herein referred to as the Site).The objective of the PSI was to assess the potential risk of contamination and determine the site suitability for the proposed road duplication works.

The site is occupied by Tharwa Drive and includes the road reserves on the eastern and western sides of the existing road. A feasibility study for the proposed Tharwa Drive duplication is in progress, with the proposed development area located within the existing road reserves.

The scope of this PSI comprised of the following:

- Acquisition and review of desktop documentation and associated historical information to assess whether there are any known contaminating activities either on the site or on neighbouring properties.
- A review of the environmental setting with regards to geology, topography, hydrology, and hydrogeology.
- Site visit to characterise the property setting, including inspection of the site surface for obvious and visible signs of potential contamination and / or contaminant sources.
- A visual evaluation of surrounding land uses to identify any neighbouring activities which may have affected or present a potential risk to the environmental quality of the site.

Investigations across the site and its surroundings have identified two (2) areas of environmental concern (AECs):

- AEC 1 – Potential imported fill material used for the Tharwa Drive construction including, the associated road reserve.
- AEC 2 – Storage of construction and imported materials on the western road reserve in the southern portion of the site. Construction materials such as asphalt, gravel potentially mixed with soil is stored just southeast of the Pockett Avenue roundabout, located just outside the feasibility study area.

The contaminants of potential concern (COPCs) that may be associated with the presence of these AECs include the following:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine pesticides (OCP) and Organophosphorous pesticides (OPP);
- Polychlorinated biphenyls (PCB);
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Phenols; and
- Asbestos.

Based on the results of the investigation, there is currently insufficient information to assess whether AEC 1 and AEC 2 are suitable for the proposed road duplication from a contamination perspective. A more detailed investigation with soil sampling is recommended to further investigate the contamination risk associated with AEC 1 and AEC 2. Lanterra considers the remaining project area poses a low risk of contamination, and no further assessment is required for these areas.

1. Introduction

Calibre Group (the Client) engaged Lanterra Consulting Pty Ltd (Lanterra) to complete a Preliminary Site Investigation (PSI) for the proposed Tharwa Drive duplication between Woodcock Drive and Pockett Avenue, Gordon ACT 2906 as shown in **Appendix A, Figure 2** (herein referred to as the Site).

The site is currently occupied by Tharwa Drive including the road reserves on the eastern and western sides, covering an area of approximately 14 hectares along a 2km road.

This report forms part of the feasibility study currently being undertaken by the Client for the proposed Tharwa Drive duplication, with the proposed development area located within the existing road reserves.

The location and layout of the site is illustrated in **Figure 1** and **Figure 2, Appendix A**.

1.1 Objectives

The purpose of the PSI is to assess the potential risk of contamination to the site and determine the site's suitability for the proposed road duplication works.

1.2 Scope of Work

The following scope of work has been completed to meet the project objectives:

- Acquisition of desktop documentation and associated historical information to assess whether there are any known contaminating activities either on the site or on neighbouring properties. This includes available environmental reports, historical aerial photographs and EPA contaminated site search. As the site is an existing road and road reserve, no historical title search, ACT government building plans and dangerous substance search were undertaken.
- Review desktop documentation obtained including any available previous site investigation reports relevant to the PSI.
- A review of the environmental setting with regards to geology, topography, hydrology, and hydrogeology.
- A site visit to characterise the property setting, including inspection of the site surface for obvious and visible signs of potential contamination and / or contaminant sources.
- A visual evaluation of surrounding land uses to identify any neighbouring activities which may have affected or present a potential risk to the environmental quality of the site.
- Preparation of a PSI report in general accordance with the requirements of ACT EPA endorsed guidelines.

1.3 Regulatory Guidelines / Legislations

The investigation and preparation of this report was undertaken with reference to (but not limited to) the following regulatory guidance documents and standards:

- *ACT Government (2020) Information Sheet 11 - EPA Report Submission Requirements;*
- *ACT Government (2020) Information Sheet 7 – Guidance for Undertaking Preliminary Contamination Investigations for Development/Lease Variation Purposes;*
- *ACT EPA (2017) Contaminated Sites Environment Protection Policy;*
- *ACT EPA (2007) General Environment Protection Policy;*

- *National Environmental Protection Council (NEPC) (2013). National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended April 2013);*
- *NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Ed.) (2017);*
- *NSW EPA (1995) Sampling Design Guidelines (1995);*
- *NSW EPA (2020) Contaminated Land Guidelines - Consultants Reporting on Contaminated Land; and*
- *Standards Australia (2005). Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds AS4482.1 (2005) and Part 2: Volatile substances, AS4482.2 (2005).*

1.4 Limitations

The findings of the report are based on the Scope of Work outlined above. Lanterra performed services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties express or implied, are made.

Subject to the Scope of Work, the assessment was limited strictly to identifying typical environmental conditions associated with the subject property area and does not include evaluation of any other issues.

The absence of any identified hazardous or toxic materials on the subject property should not be interpreted as a guarantee that such materials do not exist on the site. Lanterra will not investigate any waste materials from the property that may have been disposed of off the site, nor related waste management practices.

The results of this assessment will be based upon the site inspection and the sampling specified above conducted by Lanterra personnel and information from the Client or regulatory agencies. All conclusions and recommendations regarding the property area will be the professional opinions of the Lanterra personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability will be made, Lanterra will not assume responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Lanterra, or developments resulting from situations outside the scope of this project.

2. Site Characteristics

2.1 Site Location

The site location and a detailed site plan are presented as Figure 1 and Figure 2, Appendix A.

Table 1: *Summary of Site Details*

Site Characteristics	Detail
Street Address	Intersection of Woodcock Drive and Tharwa Drive to intersection of Pockett Avenue and Tharwa Drive, Gordon ACT 2906
Approximate Easting and Northing (centre of site)	Easting: 689720.25 Northing: 6073472.92
Approximate Elevation (m AHD)	590 – 608 m
Block, Section, Division Land Zoning	Not available (existing Tharwa Drive road reserve)
Current Land Use	Existing Tharwa Drive and Road Reserve
Investigation Area	Approximately 140,615 m^2 Approximately 2 km in length

2.2 Site Description

The following description is based on observations made during a site visit conducted on Monday 19th October 2020 by a suitably qualified environmental scientist from Lanterra:

- The site is primarily occupied by the existing Tharwa Drive and road reserves on the eastern and western side of the road.
- The area on the western road reserve is significantly larger than the eastern road reserve.
- As the road progresses south, it travels across a bridge over a floodway just after Box Hill Avenue (see **Appendix B: Photo 4).** A gross pollutant trap is located on the eastern road reserve further south of the floodway (see **Appendix B: Photo 5).**
- A new pedestrian footpath and pedestrian traffic light is recently constructed on the northern portion of the site, connecting the western road reserve to the Lanyon Market Place.
- The western road reserve on the southern portion of the site showed signs of materials storage (stockpiling), with residual compost, spoil and mulch visible on the surface. A small stockpile of coarse mulch was present at the time of site inspection (see **Appendix B: Photo 1-2).**
- Stockpiles of asphalt potentially mixed with other soil materials, stockpiles of gravel, mulch and compost were located just southeast of the Pockett Avenue roundabout (see **Appendix B: Photo 7-8**).
- The road reserve areas were predominantly covered with grass, with obvious vehicle tracks located along the western side of the reserve. Mature tree lines run along both road reserves.
- A footpath runs along the eastern road reserve close to Tharwa Drive, with the footpath on the western verge located along the residential suburb further away from the road (western boundary).

A detailed site plan is presented in **Figure 2, Appendix A** while photographs of the site are provided in **Appendix B.**

2.3 Surrounding Land Uses

A summary of the land uses that surround the site are as follows:

- **North:** Amala Retirement Village and Lanyon Marketplace shopping centre;
- **South:** Low-density residential housing in Gordon and Banks;
- **East:** Lanyon Vikings club and low-density residential houses beyond; and
- **West:** Gordon District playing field and low density residential housing in Gordon.

2.4 Sensitive Environments

Sensitive environments located within a 500 m radius of the site include a stormwater channel that drains to Point Hut Pond to the west of Tharwa Drive.

There is an early learning centre and primary school to the northeast of the site and low-density residential housing surrounding Tharwa Drive.

2.5 Proposed Land Use

The Client is currently undertaking a feasibility study for the proposed Tharwa Drive duplication, with the proposed development area located within the existing road reserves (see **Appendix A: Figure 3**).

3. Site History

3.1 Previous Investigations

Lanterra was advised no previous investigation was completed for the site and therefore were not available for review.

3.2 Zoning

According to the ACT Territory Plan, the site is road reserve, zoned as TSZ1: Transport Zone.

3.3 Land Title Search

A land title search was not undertaken due to the fact the site is a road reserve.

3.4 Aerial and Historical Photograph Review

A Lotsearch (Environmental Risk Report) was acquired to review the site history, which included historical aerial photographs of the site. A summary of each photograph examined as a part of the investigation is provided in Table 2 below. A copy of the Lotsearch Report is presented in **Appendix C**.

Table 2: *Details of the Review of Aerial Photographs*

Date	Description of the Subject Site	Description of Surrounding Land
1944	The site appears to be an agricultural property with fenced paddocks of improved pasture, with an unsealed road running from north to south.	The surrounding area appears to cleared paddocks used for agricultural purposes. An unsealed road appears to be located to the north, northwest of the site. The land located to the southeast and southwest of the site has sparse stands of eucalypts within the cleared areas.
1961	Three dams appear to have been constructed in the southern portion of the site. Most of the eucalypts have been removed from the southwest area of the site.	The surrounding area to the southeast and southwest has been cleared of most of the eucalypts. Dams have been constructed to the east and west of the site. The surrounding area to the east appears to have an airstrip in the paddock running from east to west.
1967	No discernible differences to the site are apparent.	No discernible differences in the surrounding area are apparent.
1978	A building has been constructed in the southwest portion of the site.	No discernible differences in the surrounding area are apparent.
1981	No discernible differences to the site are apparent.	No discernible differences in the surrounding area are apparent.
1985	No discernible differences to the site are apparent.	No discernible differences in the surrounding area are apparent.
1992	Most of the site has undergone urban development (civil infrastructure, roads, residential properties etc). The former unsealed	The surrounding areas have undergone urban development works (civil infrastructure, roads and residential properties, etc). A sediment

Date	Description of the Subject Site	Description of Surrounding Land
	road appears to have been relocated and redeveloped into the present day Tharwa Drive.	retention pond has been constructed to the northwest of the site in the surrounding area.
1997	It appears to have most of the residential properties constructed in the southern portion of the site. The site of the Lanyon Marketplace appears to have undergone further civil works. Two sporting ovals have been constructed adjacent to Tharwa Drive in the northern area of the site.	St Claire of Assisi Primary, Charles Conder Primary and Lanyon High Schools have been constructed in the surrounding area to the east of the site.
2004	The Lanyon Marketplace has been constructed in the northeast portion of the site.	No discernible differences in the surrounding area are apparent.
2009	No discernible differences to the site are apparent.	No discernible differences in the surrounding area are apparent.
2014	No discernible differences to the site are apparent.	Residential premises have been constructed in the northwest portion of the site.

3.5 ACT EPA Contaminated Site Search

Lanterra requested a contaminated land search under Section 21 (A) of the *Environment Protection Act (1997)* from the ACT EPA.

The EPA noted that roads have been associated with potential site contamination due to the placement of uncontrolled fill during the road establishment.

The *ACT EPA Contaminated Sites Environment Protection Policy* 2017 lists landfilling as an activity associated with land contamination which may pose a risk to human health and the environment.

EPA records also indicate that there is an operational service station located at the adjacent block, Block 1 Section 226, Conder. There is no information recorded by the EPA that the service station on the adjacent block has adversely impacted Tharwa Drive.

A copy of the contaminated land search is presented in **Appendix D**.

3.6 Worksafe ACT Dangerous Goods Search

No Worksafe ACT Dangerous Goods Search was undertaken for this PSI based on the site location of the existing road and road reserve.

3.7 Storage Tanks

Evidence of storage tanks were not noted during the site visit.

3.8 Building File Search

No building file search was conducted for this investigation based on the site location of the existing road and road reserve.

3.9 Information from Land Owner/Custodian

No information was provided by the landowner/custodian (Roads ACT) of the site.

3.10 Hazardous Materials

No hazardous materials were observed during the site visit undertaken the 19 October 2020. However, imported mulch/compost materials which could be a source of contamination to the site were observed in a stockpile located on the western road verge in the southern portion of the site (see **Appendix B, Photo 1-2**). No further information regarding the source of the materials was available, with materials likely imported to do landscape maintenance work along the tree line.

3.11 Chemical Storage

There was no evidence of chemical storage on the site, based on the site visit on 19 October 2020.

3.12 Manufacturing Processes

There are no known manufacturing processes that currently occur or have previously occurred on the site.

3.13 Discharges to Land, Water and Air

No information regarding discharges to land, water and air was available for review at the time of writing this report. As no manufacturing operations are known to have occurred at the site, it is unlikely that there may have been previous discharges to land, water or air in the past.

4. Site Condition and Environmental Setting

4.1 Topography

The digital topographic map presented in ACTmapi (available at http://www.actmapi.act.gov.au/) indicates the site has an elevation of approximately 590 – 608 m above Australian Height Datum (m AHD).

The general topography of the site is relatively flat and the surrounding area slopes from the north-east to the south-west.

4.2 Visible Signs of Contamination

There were no visible indications of contamination observed during the site visit conducted on 19 October 2020.

Signs of regular vehicle use as tracks and ground disturbance was observed on the western road reserve area.

4.3 Fill Material

Fill material has potentially been imported as a part of the Tharwa Drive construction including the road reserve. Part of the areas on the road reserve on the western side also showed signs of cut and fill activity, particularly along the tree line (see **Appendix B: Photo 1-2, 11-12**).

Patches of disturbed ground were observed along the western road reserve which may be associated with underground utility maintenance work as surface soil had indications of reworked soil materials (see **Appendix B: Photo 10**).

There was stockpiled asphalt mixed with potentially imported soil of unknown origin, mulch and compost located south of the site as shown in **Appendix B: Photo 7-8** (south of Pockett Avenue roundabout). Site observation notes this area is used by Downer to store materials for road works in the area.

4.4 Odours

There were no olfactory indicators of possible contamination during the site walkover.

4.5 Staining

There was no evidence of hydrocarbon staining on the site.

4.6 Vegetation

No significant vegetation stress was observed across the site, with areas on road reserves that are regularly tracked by vehicles that did not demonstrate grass cover (see **Appendix B: Photo 3, 9-12).**

5. Geology and Hydrogeology

5.1 Geology

The 1:100,000 Geological Series, Canberra, New South Wales and Australian Capital Territory, Sheet 8727 (Bureau of Mineral Resources, 1992) shows that the site is underlain by Quarternary Alluvials comprising of gravel, sand, silty clay and black organic clay. The central portion of the site is underlain by beds from the late Silurian comprised of Rhydacitic ignimbrite, minor volcaniclastic and argillaceous sediments. The southern portion of the site is underlain by beds of the Tertiary Quaternary comprised of Fanglomerate and poorly cemented conglomerate, gravel and sand: colluvium.

5.2 Hydrogeology

A groundwater bore search was provided within the Lotsearch report (**Appendix C**). The purpose of the bore search was to document the location and depth of any nearby registered groundwater bores, and the associated quality of the groundwater so that potential impacts of contaminants from the site or surrounding land uses (if any) on local users of groundwater may be assessed. A copy of the groundwater bore search results is presented in **Appendix C**.

This search indicated that there is one (1) abstraction groundwater borehole according to the ACT Government data source within 2,000 m of the site and three (3) groundwater boreholes were registered with the Bureau of Meteorology within 2,000 m of the site. The nearest of these boreholes is located approximately 96 m to the northwest of the site.

A review of the Bureau of Mineral Resources (1984) Hydrogeology of the Australian Capital Territory and Environs indicates that groundwater is hosted in unconsolidated rocks with low to mid yielding zones associated with alluvium and colluvium of the Cainzoic period. The quality of groundwater is expected to be variable, the total dissolved solids (TDS) anticipated to be less than 500 milligrams per litre (mg/l) and the yield is estimated to be 0.5-1.0 litres per second (l/sec).

Based on the topography of the site and the nearest water body, which is the stormwater drain to the north and drains into Point Hut Pond to the north west, the groundwater flow direction is inferred to be in a north-west direction.

5.3 Hydrology

Surface water on the site is expected to follow the topographic contours of the site and flow in a north west direction where water would be captured by a stormwater channel located 270 m south of the intersection of Woodcock Drive and Tharwa Drive. This channel flows to Point Hut Pond located 280 m to the west of Tharwa Drive.

5.4 Acid Sulfate Soil Risk

A review of the Australian Soil Resource Information System (ASRIS) map shows the subject site to be situated in an area of “Low probability” of occurrence for acid sulfate soil.

6. Assessment Criteria

The assessment criteria that was adopted for the investigation was based on the investigation objective to determine the site suitability for the proposed road duplication of Tharwa Drive. Therefore the following criteria would be adopted from the following applicable guidelines/legislation:

- ACT EPA (2009) '*Contaminated Sites Environment Protection Policy*'.
- National Environment Protection Council (1999) '*National Environment Protection (Assessment of Site Contamination) Measure 1999*' (amended 2013) (ASC NEPM 2013).

Therefore, the following criteria have been adopted from the ASC NEPM 2013:

- Health Based Investigation Levels for Commercial/Industrial Sites (HIL-D);
- Health Based Screening Levels for Commercial/Industrial Sites (HIL-D) for a clay lithology and a depth of 0 m to <1 m below ground level. These depths have been chosen as a conservative approach, however, depending on the observation from site soils may be revised as necessary.
- Ecological Investigation Levels (EIL) Commercial/Industrial sites within the upper 2m bgl for aged contaminants.
- Ecological Screening Levels (ESL) for Commercial/Industrial sites within the upper 2m bgl for fine soil-based, however, depending on the observation from site soils may be revised as necessary.

The criteria be adopted for the investigation is presented in **Table *3*** below.

Table 3: *Assessment Criteria to be Adopted for Contaminants of Potential Concern*

Contaminant Group	HIL/HSL – D (mg/kg)	EIL – Urban Commercial and Industrial (mg/kg)	ESL – Commercial and Industrial (mg/kg)
Heavy Metals			
Arsenic	3,000	160	-
Cadmium	900	-	-
Chromium (VI)	3,600	-	-
Copper	240,000	-	-
Lead	1,500	-	-
Nickel	6,000	-	-
Zinc	400,000	-	-
Mercury	730	-	-
Pesticides			
Aldrin and Dieldrin	45	-	-
Chlordane	530	-	-
DDT	-	640	-
DDT+DDD+DDE	3,600	-	-
Endrin	100	-	-

Contaminant Group	HIL/HSL – D (mg/kg)	EIL – Urban Commercial and Industrial (mg/kg)	ESL – Commercial and Industrial (mg/kg)
HCB	80	-	-
Heptachlor	50	-	-
Methoxychlor	2,500	-	-
Mirex	100		
Toxaphene	160	-	-
TRH and BTEX			
TRH C6-C10 – BTEX (F1)	310	-	215
TRH >C10-C16 – Naphthalene (F2)	NL	-	170
TRH >C16-C34 (F3)	-	-	2,500
TRH >C34-C40 (F4)	-	-	6,600
Benzene	4	-	95
Toluene	NL	-	135
Ethylbenzene	NL	-	185
Xylene	NL	-	95
PAHs and PCBs			
Total PAH	4,000	--	-
Carcinogenic PAHs as B(a)P TEQ	40	-	1.4*
Naphthalene	NL	370	-
Phenol	240,000	-	-
PCBs	7	-	-

*NL is considered to be non-limiting whereby the concentration of contaminant to pose a soil vapour risk exceeds the soil saturation volume. ESL for Benzo(a)pyrene.

7. Conceptual Site Model

Conceptual site models (CSM) are a method of presenting site contamination information and the relationships between sources of contamination, how it may have been introduced to the site, possible pathways for contaminant migration and exposure and the receptors that may be affected by contaminants.

The following conceptual site model has been prepared based on the information presented in the Lotsearch Report and document searches and observations made during the site visit on 19 October 2020.

7.1 Areas of Environmental Concern

Based on the information presented in the Lotsearch report, the review of historical images and the site visit, the following areas of environmental concern (AECs) have been defined.

AEC 1: Imported Fill Material

Imported fill materials may have been used during the construction of Tharwa Drive and the associated road reserve. Should fill have been imported and used on the site, there is a risk that contamination was introduced to the site from the source of the fill.

AEC 2: Stockpile Storage Area

Storage of construction and imported materials on the western road reserve in the southern portion of the site.

AEC 2 is located in the western road reserve in the southern portion of the site and has several stockpiles of asphalt, gravel with possible imported soil and general waste debris. While not observed, there is the possibility that asbestos-containing materials may be present in the stockpiles.

As the origin of this material is not known, each stockpile should be assessed for its suitability to either be reused on the site or disposal off-site.

Lanterra notes this area whilst is within the investigation area for the PSI, is located just outside of the proposed feasibility study area.

7.2 Contaminants of Potential Concern

To comprehensively characterise the site and based on some of the activities associated within the site and its respective AEC the following contaminants of potential concern (COPC) were identified.

Table 4: *Identified CoPCs and the associated AECs*

AECs	CoPCs
AEC 1 – Imported Fill	• Total recoverable hydrocarbons (TRH) • Benzene, toluene, ethylbenzene, xylene (BTEX) • Polycyclic aromatic hydrocarbons (PAH) • Polychlorinated biphenyls (PCBs) • Phenols • Organochlorine pesticides/organophosphorus pesticides (OCP/OPPs) • Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) • Asbestos

AECs	CoPCs
AEC 2 – Storage of construction and imported materials	• Total recoverable hydrocarbons (TRH) • Benzene, toluene, ethylbenzene, xylene (BTEX) • Polycyclic aromatic hydrocarbons (PAH) • Polychlorinated biphenyls (PCBs) • Phenols • Organochlorine pesticides/organophosphorus pesticides (OCP/OPPs) • Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) • Asbestos

7.3 Exposure Pathways and Receptors

For a contaminant to pose a risk to either human health and/or the environment, there must be a potentially complete or complete pathway between the contaminant and the receptor.

Common pathways for which contaminants may migrate through the environment on the site and result in exposure to receptors are summarised in **Table 5** below.

Table 5: *Summary of Exposure Pathways*

Pathway	Contaminants of Concern	Exposure Pathway Complete or Potentially Complete (Yes/No)	Potential Receptors	Comments
Direct Contact with Soil including dermal contact and ingestion	TRH, BTEX, PAH, PCB, Heavy metals, Phenols, OCP, OPP and asbestos	Potentially Complete	• Site workers • Road users • Neighbouring residents • Ecological receptors (terrestrial faunas)	There is potential that contaminants may have been present in the imported fill material used during the construction of Tharwa Drive and the road reserve.
Direct Contact with Groundwater including dermal contact and ingestion	TRH, BTEX, PAH, PCB, Heavy metals, Phenols, OCP, OPP	No	Groundwater	No groundwater abstraction wells are located on the site. Exposure risk via groundwater is considered to be minimal and the exposure pathway is considered incomplete.
Inhalation of Asbestos Fibres	Asbestos	Potentially Complete	• Site workers • Road users • Neighbouring residents • Ecological receptors (terrestrial faunas)	If asbestos is present in the imported material or stockpiled material then the pathway would be complete, therefore the exposure pathway is considered to be potentially complete.

Pathway	Contaminants of Concern	Exposure Pathway Complete or Potentially Complete (Yes/No)	Potential Receptors	Comments
Inhalation of gasses and vapour	TRH, BTEX	Potentially Complete	• Site workers • Road users • Neighbouring residents	If contaminants of concern are present then the pathway would be complete, therefore the exposure pathway is considered to be potentially complete.

In its current condition, there are potentially complete contaminant exposure pathways which are dependent on whether COPCs are present at an unacceptable level.

8. Summary and Conclusions

Calibre Group engaged Lanterra Consulting Pty Ltd to complete a Preliminary Site Investigation for the proposed Tharwa Drive duplication between Woodcock Drive and Pockett Avenue, Gordon ACT 2906 as shown in **Appendix A, Figure 2**. The objective of the PSI was to assess the potential risk of contamination and determine the site suitability for the proposed road duplication works.

The site is occupied by Tharwa Drive and includes the road reserves on the eastern and western sides of the existing road. A feasibility study for the proposed Tharwa Drive duplication is in progress, with the proposed development area located within the existing road reserves.

Investigations across the site and its surroundings have identified two (2) areas of environmental concern (AECs):

- AEC 1 – Potential imported fill material used for the Tharwa Drive construction including, the associated road reserve.
- AEC 2 – Storage of construction and imported materials on the western road reserve in the southern portion of the site. Construction materials such as asphalt, gravel potentially mixed with soil is stored just southeast of the Pockett Avenue roundabout, located just outside the feasibility study area.

The contaminants of potential concern (COPCs) that may be associated with the presence of these AECs include the following:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Organochlorine pesticides (OCP);
- Organophosphorous pesticides (OPP);
- Polychlorinated biphenyls (PCB);
- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Phenols; and
- Asbestos.

Based on the results of the investigation, there is currently insufficient information to assess whether AEC 1 and AEC 2 are suitable for the proposed road duplication from a contamination perspective. A more detailed investigation with soil sampling is recommended to further investigate the contamination risk associated with AEC 1 and AEC 2. Lanterra considers the remaining project area poses a low risk of contamination, and no further assessment is required for these areas.

9. References

ACT EPA (2017) '*Contaminated Sites Environment Protection Policy*'

ACT Government (2020) '*Information Sheet 11 - EPA Report Submission Requirements*'.

ACT Government (2020) '*Information Sheet 7 – Guidance for Undertaking Preliminary Contamination Investigations for Development/Lease Variation Purposes*'.

ACT EPA (2007) '*General Environment Protection Policy*'.

Bureau of Mineral Resources, Geology and Geophysics (1984) '*1:100,000 Hydrogeology of the Australian Capital Territory and Environs*'

Bureau of Mineral Resources, Geology and Geophysics (1992) '*1:100,000 Geological Series, Canberra, New South Wales and Australian Capital Territory, Sheet 8727*'

National Environmental Protection Council (NEPC) (2013) '*National Environment Protection (Assessment of Site Contamination) Measure 1999*' (as amended April 2013).

NSW EPA (2017) '*Guidelines for the NSW Site Auditor Scheme (3rd Ed.)'*.

NSW EPA (1995) '*Sampling Design Guidelines*'

NSW EPA (2020) '*Contaminated Land Guidelines - Consultants Reporting on Contaminated Land*'.

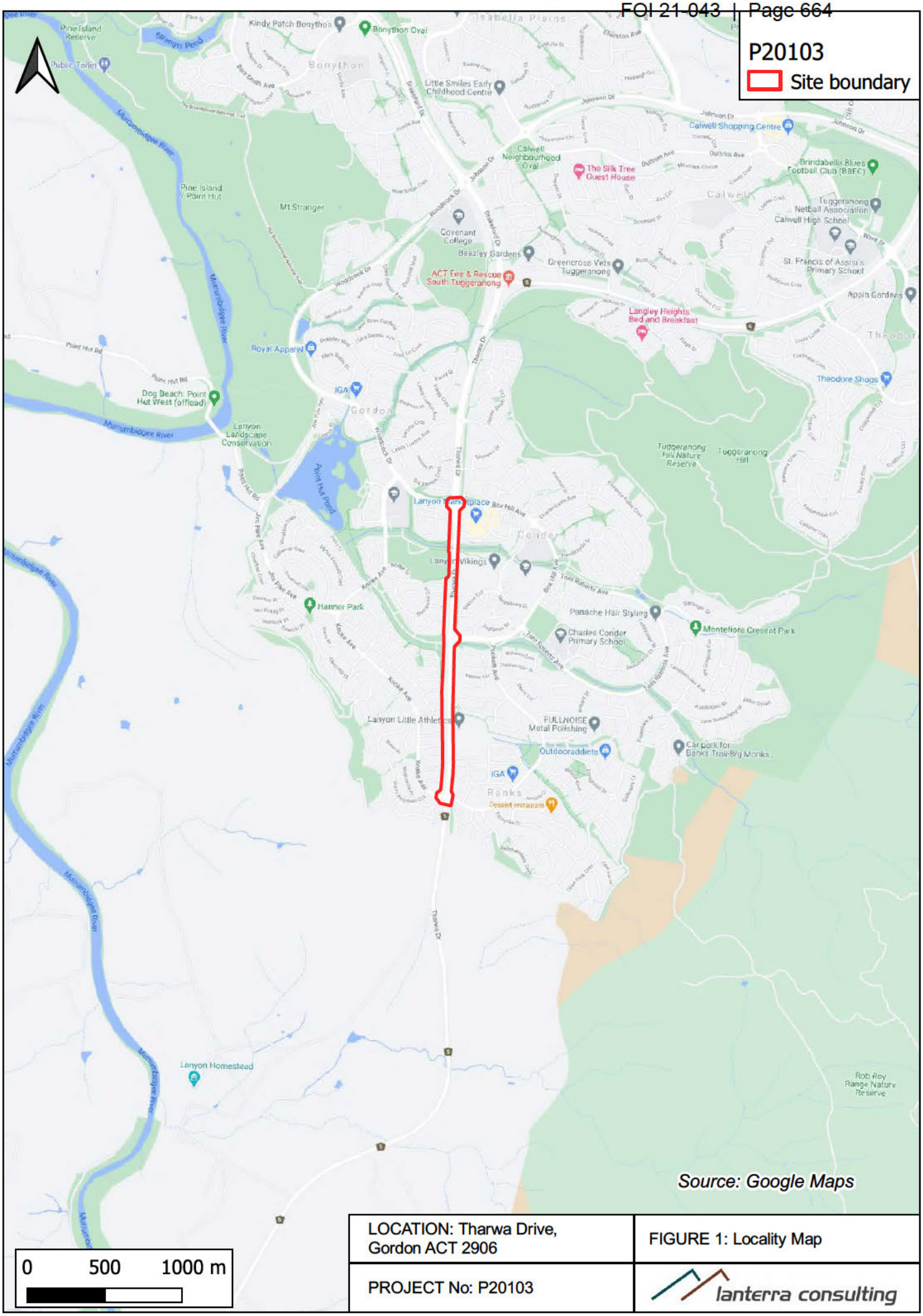
Standards Australia (2005) '*Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds AS4482.1 (2005) and Part 2: Volatile substances, AS4482.2 (2005)*'.

10. Glossary

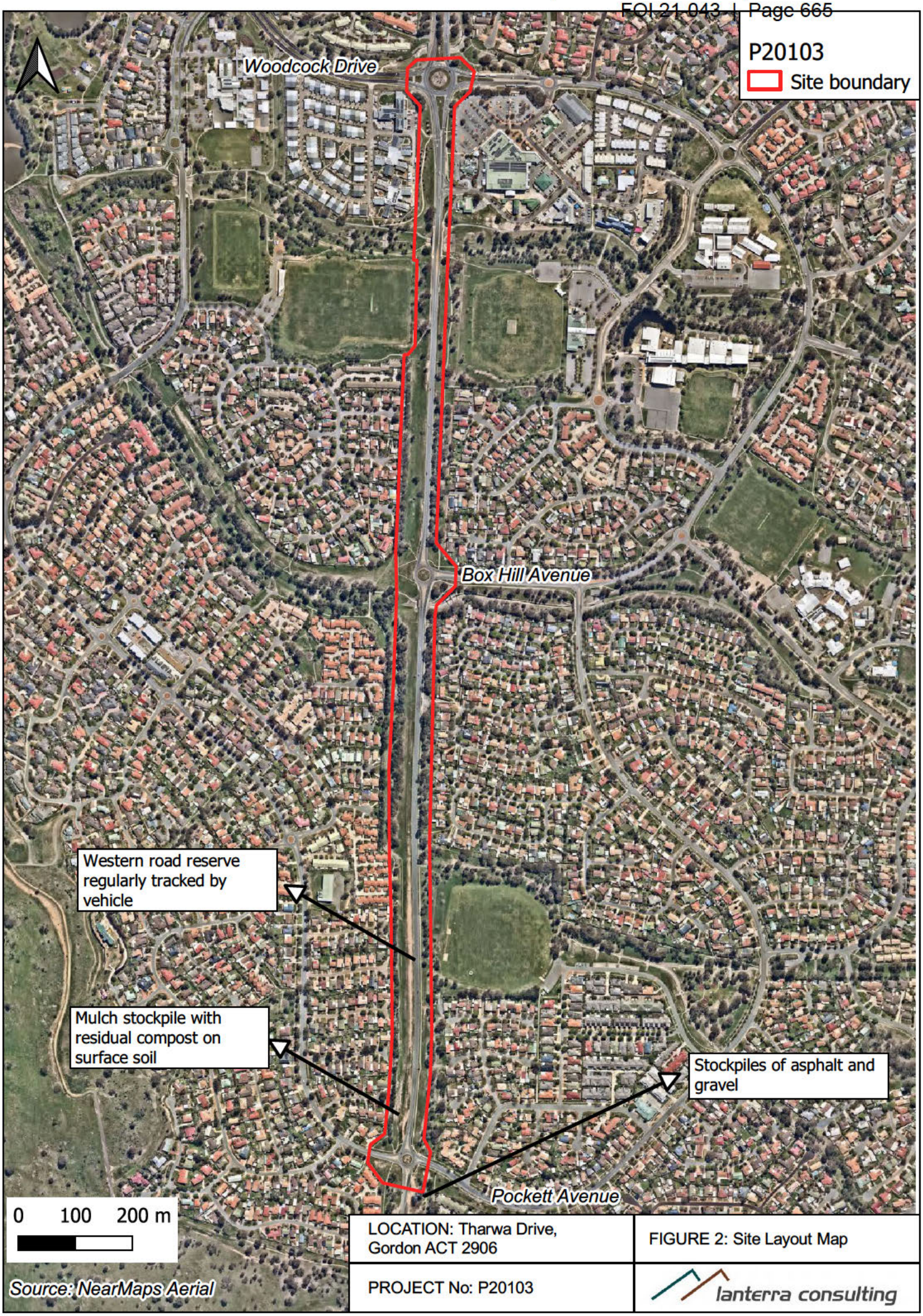
ACM	Asbestos-containing material
ACT	Australian Capital Territory
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ANZG	Australia and New Zealand Guidelines
ASC NEPM 2013	National Environment Protection (Assessment of Site Contamination Measure 1999' as amended 2013.
Bgl	Below ground level
BRU	Beneficial Reuse
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes, Napthathlene
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EIL	Ecological Investigation Level
ESL	Ecological Screening Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
kg	Kilogram
Lanterra	Lanterra Consulting Pty Limited
mg	milligram
µg / L	Microgram per litre
NATA	National Association of Testing Authorities
NEMP	National Environment Management Plan
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
QA	Quality Assurance
QC	Quality Control
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PSI	Preliminary Site Investigation
RPD	Relative Percentage Difference
SAQP	Sampling, Analysis and Quality Plan
SQEC	Suitably Qualified Environmental Consultant
TCCS	Transport City and City Services
TEQ	Toxic Equivalence Quotient
TPH	Total Petroleum Hydrocarbon
TRH	Total Recoverable Hydrocarbon
UFP	Unexpected Finds Protocol
UFMP	Unexpected Finds Management Plan
USCS	Unified Soil Classification System

Appendix A

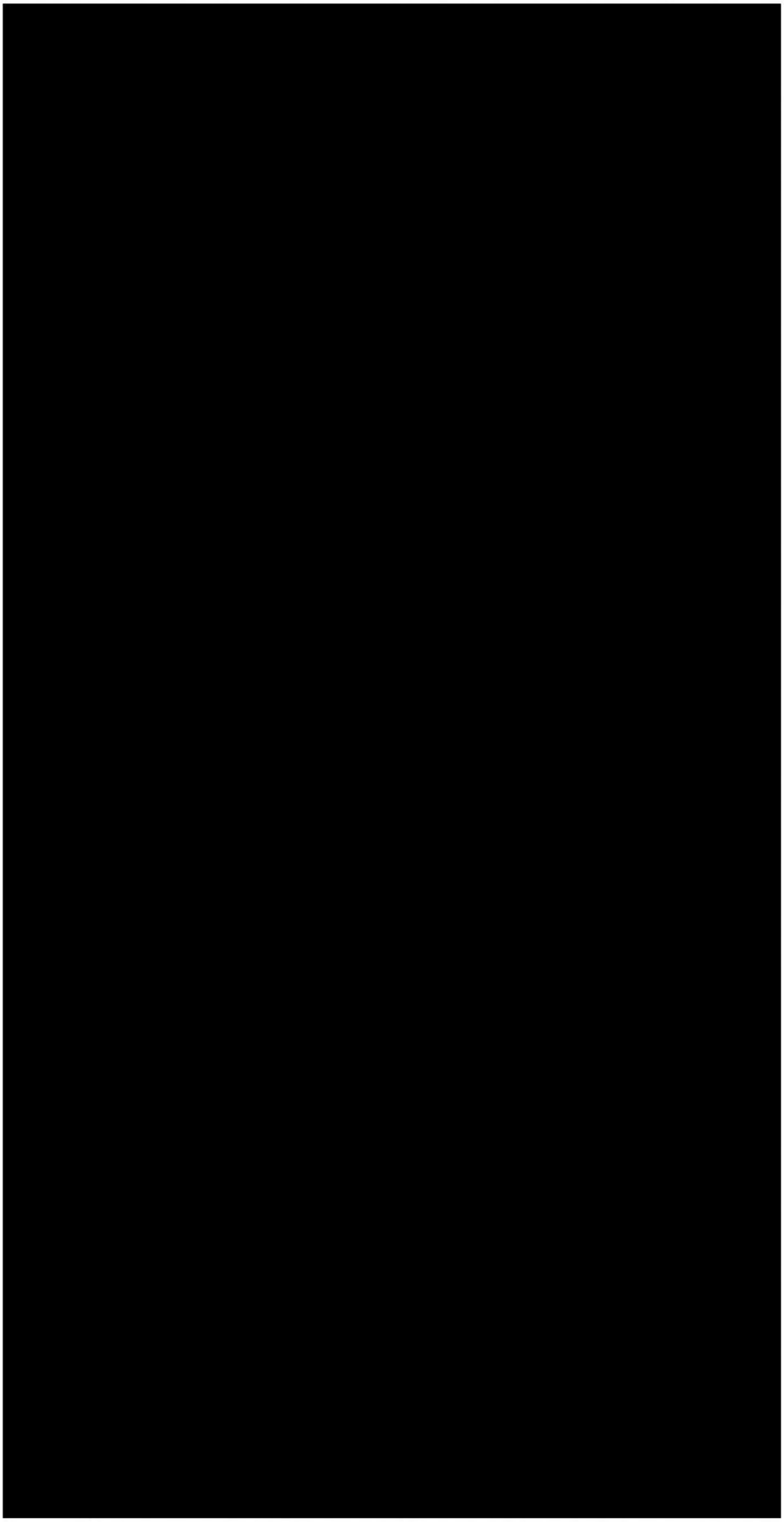
Figures



LOCATION: Tharwa Drive, Gordon ACT 2906	FIGURE 1: Locality Map
PROJECT No: P20103	lanterra consulting



LOCATION: Tharwa Drive, Gordon ACT 2906	FIGURE 2: Site Layout Map
PROJECT No: P20103	Ianterra consulting



Source: Calibre Group

LOCATION: Tharwa Drive, Gordon ACT 2906	FIGURE 3: Proposed Tharwa Drive Duplication Area
PROJECT No: P20103	lanterra consulting

Appendix B

Site Photographs

lanterra consulting	**SITE PHOTOGRAPHS**

Client Name	**Site Location**	**Project No.**
Calibre Group	Tharwa Drive (between Woodcock Drive and Pockett Avenue)	P20103

Photo No.	**Date**
1.	19/10/2010

Description

Stockpile of mulch on the western road verge in the southern portion of the site with potential cut and fill along the tree line. Photo facing north.

Photo No.	**Date**
2.	19/10/2010

Description

West road verge with vehicle tracked area and residual compost / mulch on the surface soil. Photo facing north.

lanterra consulting	**SITE PHOTOGRAPHS**

Client Name	**Site Location**	**Project No.**
Calibre Group	Tharwa Drive (between Woodcock Drive and Pockett Avenue)	P20103

Photo No.	**Date**
3.	19/10/2010

Description

West road verge with vehicle tracked area. Photo facing south.

Photo No.	**Date**
4.	19/10/2010

Description

Local drainage line entering floodway near Box Hill Avenue intersection.

lanterra consulting	**SITE PHOTOGRAPHS**

Client Name	**Site Location**	**Project No.**
Calibre Group	Tharwa Drive (between Woodcock Drive and Pockett Avenue)	P20103

Photo No.	**Date**
5.	19/10/2010

Description

Gross pollutant trap on the eastern road verge.

Photo No.	**Date**
6.	19/10/2010

Description

Typical view of the eastern road reserve with a footpath along Tharwa Drive. Photo 9facing south.

lanterra consulting	SITE PHOTOGRAPHS	
Client Name Calibre Group	**Site Location** Tharwa Drive (between Woodcock Drive and Pockett Avenue)	**Project No.** P20103

Photo No.	**Date**
7.	19/10/2010

Description

Stockpiles of asphalt with a Downer sign located just south of the Pockett Avenue roundabout (eastern side).

Photo No.	**Date**
8.	19/10/2010

Description

Stockpiles of gravel, asphlat and spoil located just south of the Pockett Avenue roundabout (eastern side).

lanterra consulting	**SITE PHOTOGRAPHS**

Client Name	**Site Location**	**Project No.**
Calibre Group	Tharwa Drive (between Woodcock Drive and Pockett Avenue)	P20103

Photo No.	**Date**
9.	19/10/2010

Description

Good ground cover on the western road reserve with a footpath further away from Tharwa Drive along the western boundary. Photo facing south.

Photo No.	**Date**
10.	19/10/2010

Description

Patches of disturbed ground with reworked site soil likely due to underground utility maintenance

lanterra consulting	SITE PHOTOGRAPHS	
Client Name Calibre Group	**Site Location** Tharwa Drive (between Woodcock Drive and Pockett Avenue)	**Project No.** P20103

Photo No.	**Date**
11.	19/10/2010

Description

New footpath near Lanyon Market Place

Photo No.	**Date**
12.	19/10/2010

Description

Likely imported materials on road reserve at the new footpath near Lanyon Market Place.

Appendix C

Lotsearch Environmental Risk Report

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Address: Tharwa Drive, Gordon, ACT 2906

Date: 24 Sep 2020 14:29:24

Reference: LS014968 EP

Report Buffer: 1000m

Disclaimer:
The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features.
You should obtain independent advice before you make any decision based on the information within the report.
The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Land Administration Databases	ACT Government	31/08/2020	31/08/2020	Quarterly	-	-	-
Register of Contaminated Sites	ACT Government - Environment Protection Authority	18/08/2020	18/08/2020	Mon hly	0	0	0
National Waste Management Facilities Database	Geoscience Australia	15/05/2020	07/03/2017	Quarterly	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	12/08/2020	15/03/2012	Quarterly	0	1	1
Defence PFAS Investigation & Management Program - Inves igation Sites	Department of Defence	14/09/2020	14/09/2020	Mon hly	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	14/09/2020	14/09/2020	Mon hly	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	28/08/2020	28/08/2020	Mon hly	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	14/09/2020	14/09/2020	Mon hly	0	0	0
EPA Authorisations	Environment Protection Authority	03/08/2020	03/08/2020	Mon hly	0	1	10
EPA Agreements	Environment Protection Authority	03/08/2020	03/08/2020	Mon hly	0	0	0
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	0	0	0
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	-	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	-	0	0
Features of Interest	ACT Government	24/07/2020	24/07/2020	Quarterly	0	7	61
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1	1	1
Hydrogeological Landscapes Units	ACT Government - Environment, Planning and Sustainable Development Directorate	04/01/2018	22/11/2017	As required	1	1	1
Groundwater Boreholes (ACT)	ACT Government	15/07/2020	15/07/2020	Quarterly	0	1	1
Groundwater Boreholes (Bureau of Meteorology)	Commonwealth of Australia (Bureau of Meteorology)	20/11/2017	25/08/2017	Annually	0	1	3
Geological Units 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		None planned	3	-	6
Geological Structures 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		None planned	0	-	0
Atlas of Australian Soils	ABARES	19/05/2017	17/02/2011	As required	1	1	2
Soil Landscapes	NSW Office of Environment & Heritage	12/08/2014		None planned	1	-	6
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1	1	3
Territory Plan Zones	ACT Government - Environment, Planning and Sustainable Development Directorate	15/07/2020	15/07/2020	Quarterly	3	23	82

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Territory Plan Overlays (Areas)	ACT Government - Environment, Planning and Sustainable Development Directorate	15/07/2020	15/07/2020	Quarterly	1	7	34
Territory Plan Overlays (Lines)	ACT Government - Environment, Planning and Sustainable Development Directorate	18/03/2019	18/03/2019	Quarterly	0	1	4
Commonwealth Heritage List	Australian Government Department of Agriculture, Water and the Environment	18/08/2020	20/11/2019	Quarterly	0	0	0
National Heritage List	Australian Government Department of Agriculture, Water and the Environment	18/08/2020	20/11/2019	Quarterly	0	0	1
Heritage Sites	ACT Government - Environment, Planning and Sustainable Development Directorate	15/07/2020	15/07/2020	Quarterly	0	0	40
Bushfire Prone Areas	ACT Government - Environment, Planning and Sustainable Development Directorate	15/07/2020	15/07/2020	Quarterly	0	1	1
Bushfire Abatement Zones	ACT Government - Environment, Planning and Sustainable Development Directorate	15/07/2020	15/07/2020	Quarterly	0	0	1
Bushfire Operational Plan - Access Management	ACT Government - Environment, Planning and Sustainable Development Directorate	07/01/2020	07/01/2020	Quarterly	0	1	1
Bushfire Operational Plan - Fuel Management	ACT Government - Environment, Planning and Sustainable Development Directorate	07/01/2020	07/01/2020	Quarterly	2	2	11
Flood 1 percent Annual Exceedance Probability	ACT Government - Environment, Planning and Sustainable Development Directorate	09/03/2018	18/01/2017	As required	0	0	0
Vegetation Communities	ACT Government	05/02/2020	05/02/2020	Annually	2	10	102
Vegetation Subforma ion	ACT Government	14/01/2019	14/01/2019	Annually	2	2	5
Threatened Woodland	ACT Government	05/02/2020	05/02/2020	Annually	0	0	5
Tree Register	ACT Government	15/07/2020	15/07/2020	Quarterly	0	0	4
Important Wetlands	ACT Government	15/07/2020	15/07/2020	Quarterly	0	0	0
Groundwater Dependent Ecosystems Atlas	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	0	0	0
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	01/09/2020	01/09/2020	Weekly	-	-	-

Aerial Imagery 2020

Tharwa Drive, Gordon, ACT 2906

Contaminated Land

Tharwa Drive, Gordon, ACT 2906

Register of Contaminated Sites

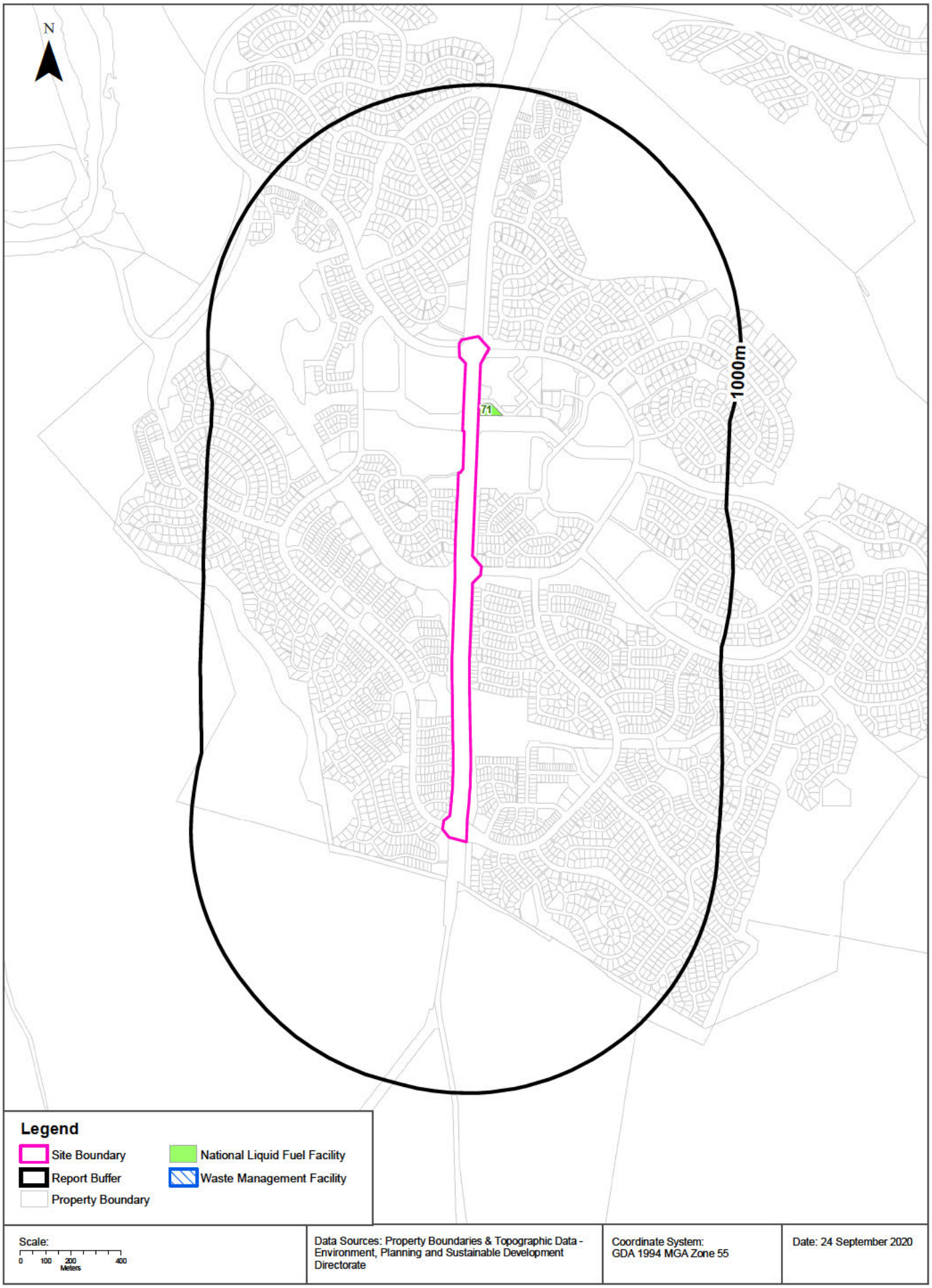
Records from the ACT Register of Contaminated Sites within the report buffer:

Map Id	Site Description	Notification	District	Division	Section	Block	Status	Loc Conf	Dist	Direction
N/A	No records in buffer									

ACT Register of Contaminated Sites Data Source: ACT Government Environment Protection Authority
Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Waste Management & Liquid Fuel Facilities

Tharwa Drive, Gordon, ACT 2906



Waste Management and Liquid Fuel Facilities

Tharwa Drive, Gordon, ACT 2906

National Waste Management Site Database

Sites on the National Waste Management Site Database within the report buffer:

Site Id	Owner	Name	Address	Suburb	Postcode	Landfill	Reprocess	Transfer	Loc Conf	Distance	Direction
N/A	No records in buffer										

Waste Management Facilities Data Source: Australian Government Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist (m)	Direction
71	Caltex	Woolworths Caltex Conder	4 Norman Lindsay Street	Conder	Petrol Station	Operational		25/07/2011	Premise Match	0m	North

National Liquid Fuel Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

PFAS Investigation and Management Programs

Tharwa Drive, Gordon, ACT 2906

Defence PFAS Investigation and Management Program Investigation Sites

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Defence PFAS Investigation and Management Program Management Sites

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

Defence PFAS Investigation and Management Program Data Source: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Location Confidence	Distance	Direction
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Tharwa Drive, Gordon, ACT 2906

Defence 3 Year Regional Contamination Investigation Program

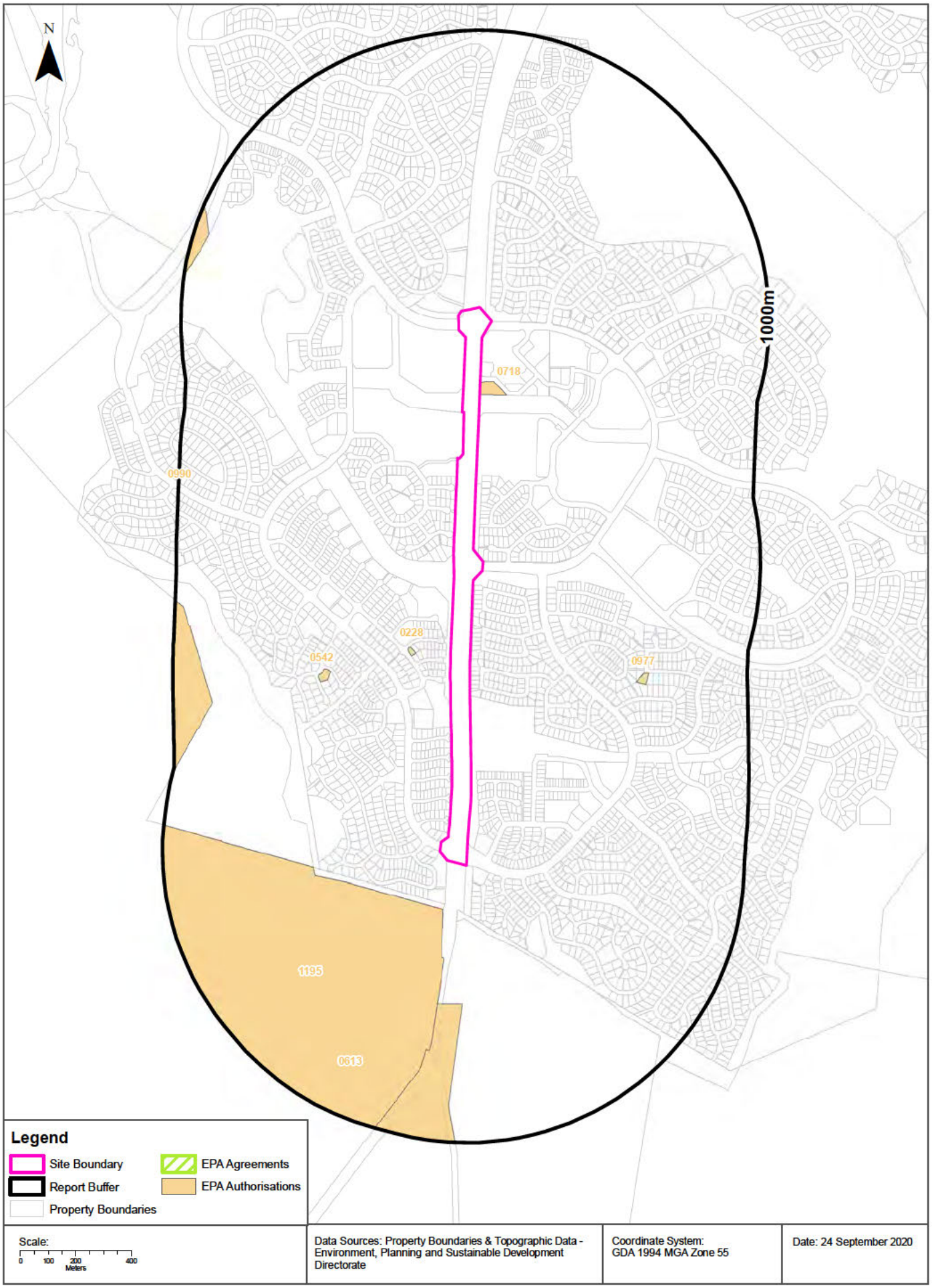
Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Authorisations and Agreements

Tharwa Drive, Gordon, ACT 2906



EPA Authorisations & Agreements

Tharwa Drive, Gordon, ACT 2906

EPA Authorisations

EPA Authorisations within the report buffer:
Note. Please click on ID Number to activate a hyperlink to online documentation. If link does not work, no documentation is accessible via the EPA.

ID Number	Activity	Business / Individual Name	Grant Date	Expiry Date	Status	Loc Conf	Distance	Direction
0718	Petroleum storage (Activity 30)	EG Fuelco (Australia) Limited - CONDER	1/14/2010		Current	Premise Match	0m	North
0228	Commercial use of chemicals (Activity 29)	Fords Pest Control	8/18/1999		Current	Premise Match	125m	South West
1195	Placement of soil on land (Activity 7)	Tranquility Construction Group Pty Ltd	5/17/2019	5/17/2022	Cancelled	Premise Match	170m	West
0542	Commercial use of chemicals (Activity 29)	Martam Pest Control Pty Ltd	2/14/2006	4/9/2008	Ceased	Premise Match	430m	South West
0613	Extraction of Material from waterways; Greater than 100m3 (Activity 1)	Parks, Conservation and Lands	4/2/2008	7/14/2011	Ceased	Premise Match	498m	North West
0977	Regulated Waste (Activity 9)	Zubus Import & Export	5/2/2014	4/7/2015	Ceased	Premise Match	597m	South East
0990	Commercial use of chemicals (Activity 29)	Prompt Pest Control & Cleaning Service	6/26/2014	10/23/2015	Cancelled	Premise Match	993m	West
0010	Commercial use of chemicals (Activity 29)	ACT Parks and Conservation Service	6/12/1998	12/18/2006	Ceased	Suburb/Area Match	-	-
0231	Burning off (Activity 28)	ACT Parks and Conservation Service	9/24/1999	12/31/1999	Expired	Suburb/Area Match	-	-
0624	Commercial use of chemicals (Activity 29)	SD & JL Pty Ltd	5/9/2008	6/27/2011	Ceased	Suburb/Area Match	-	-

EPA Authorisations Data Source: ACT Government Environment Protection Authority
Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

EPA Agreements

Note. Due to the lack of premise details within the documentation, this list does not include the following agreement:
Land development

EPA Agreements within the report buffer:
Note. Please click on ID Number to activate a hyperlink to online documentation. If link does not work, no documentation is accessible via the EPA.

ID Number	Agreement Type	Business / Individual Name	Grant Date	Expiry Date	Status	Loc Conf	Distance	Direction
N/A	No records in buffer							

EPA Agreements Data Source: ACT Government Environment Protection Authority
Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Historical Business Directories

Tharwa Drive, Gordon, ACT 2906

Business Directory Records 1950-1991
Premise or Road Intersection Matches

Universal Business Directory records from years 1950, 1961, 1970, 1982 and 1991, mapped to a premise or road intersection, within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
	No records in buffer						

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Business Directory Records 1950-1991
Road or Area Matches

Universal Business Directory records from years 1950, 1961, 1970, 1982 and 1991, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
	No records in buffer					

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Tharwa Drive, Gordon, ACT 2906

Dry Cleaners, Motor Garages & Service Stations 1950-1991 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories for years 1950, 1961, 1970, 1982 and 1991, mapped to a premise or road intersection, within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
	No records in buffer						

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Dry Cleaners, Motor Garages & Service Stations 1950-1991 Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories for years 1950, 1961, 1970, 1982 and 1991, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
	No records in buffer					

Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Aerial Imagery 2014

Tharwa Drive, Gordon, ACT 2906

Aerial Imagery 2009

Tharwa Drive, Gordon, ACT 2906

Scale: 0 125 250 375 500 Meters

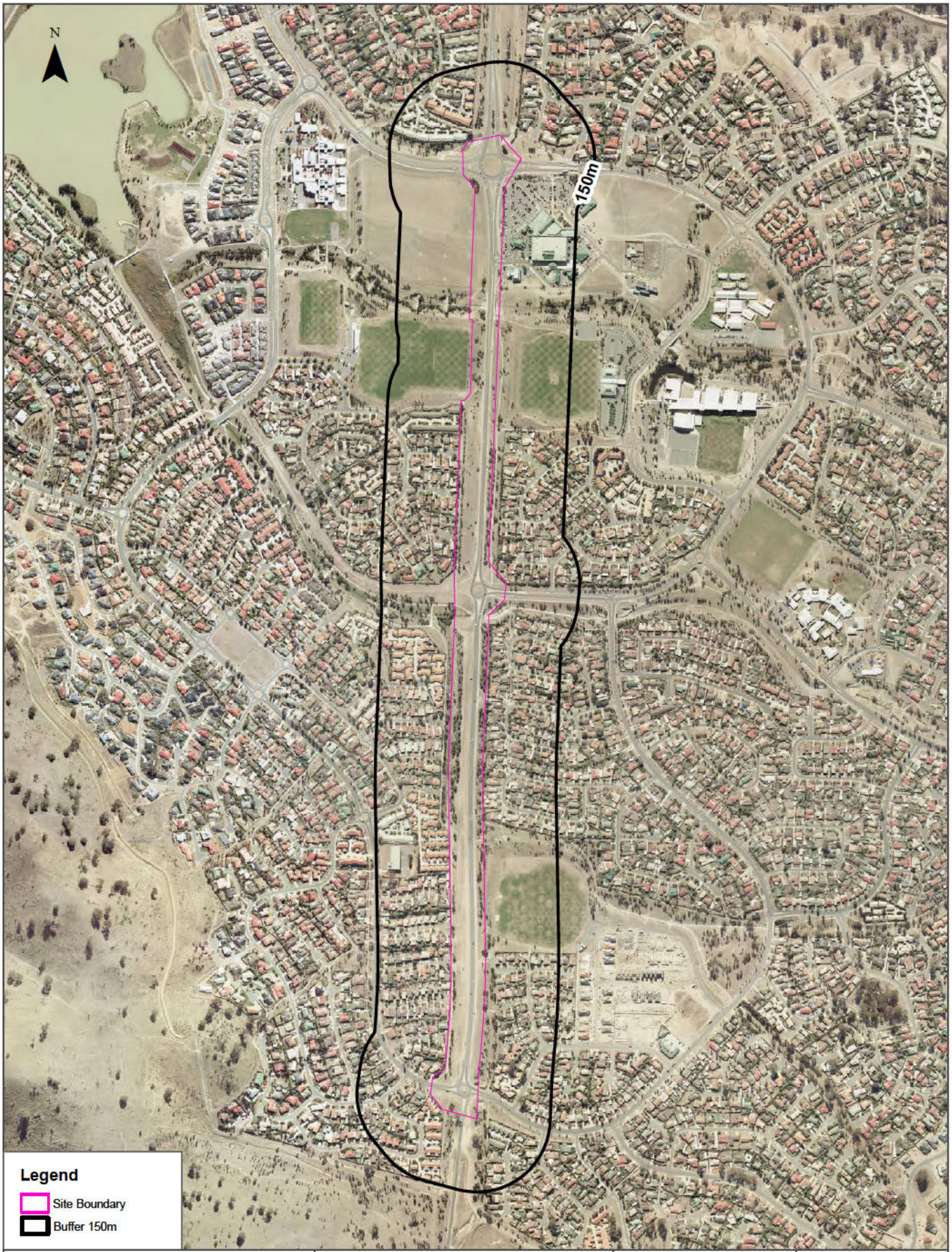
Data Source Aerial Imagery: © 2020 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System: GDA 1994 MGA Zone 55

Date: 22 September, 2020

Aerial Imagery 2004

Tharwa Drive, Gordon, ACT 2906

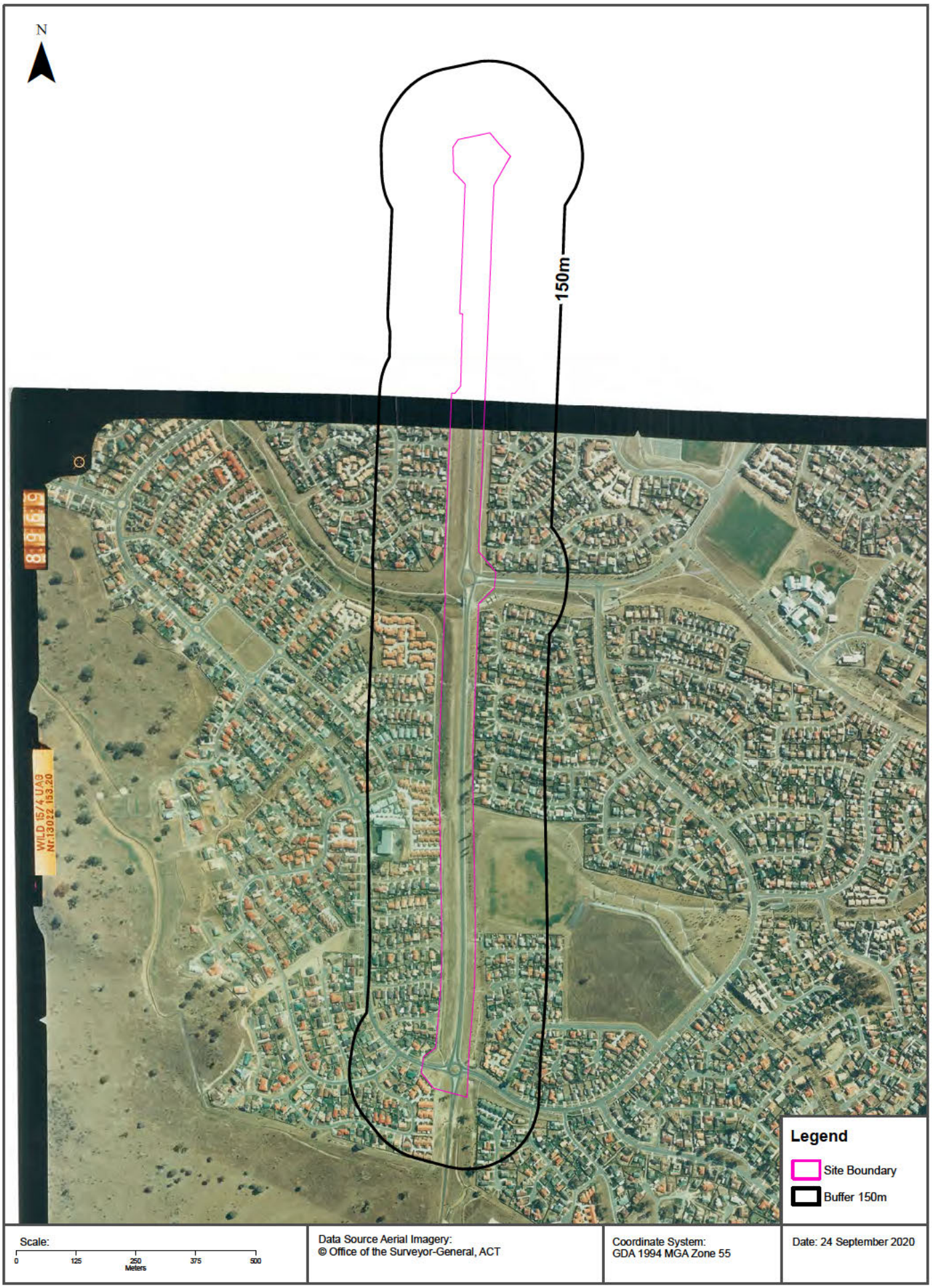


Aerial Imagery 1997

Tharwa Drive, Gordon, ACT 2906

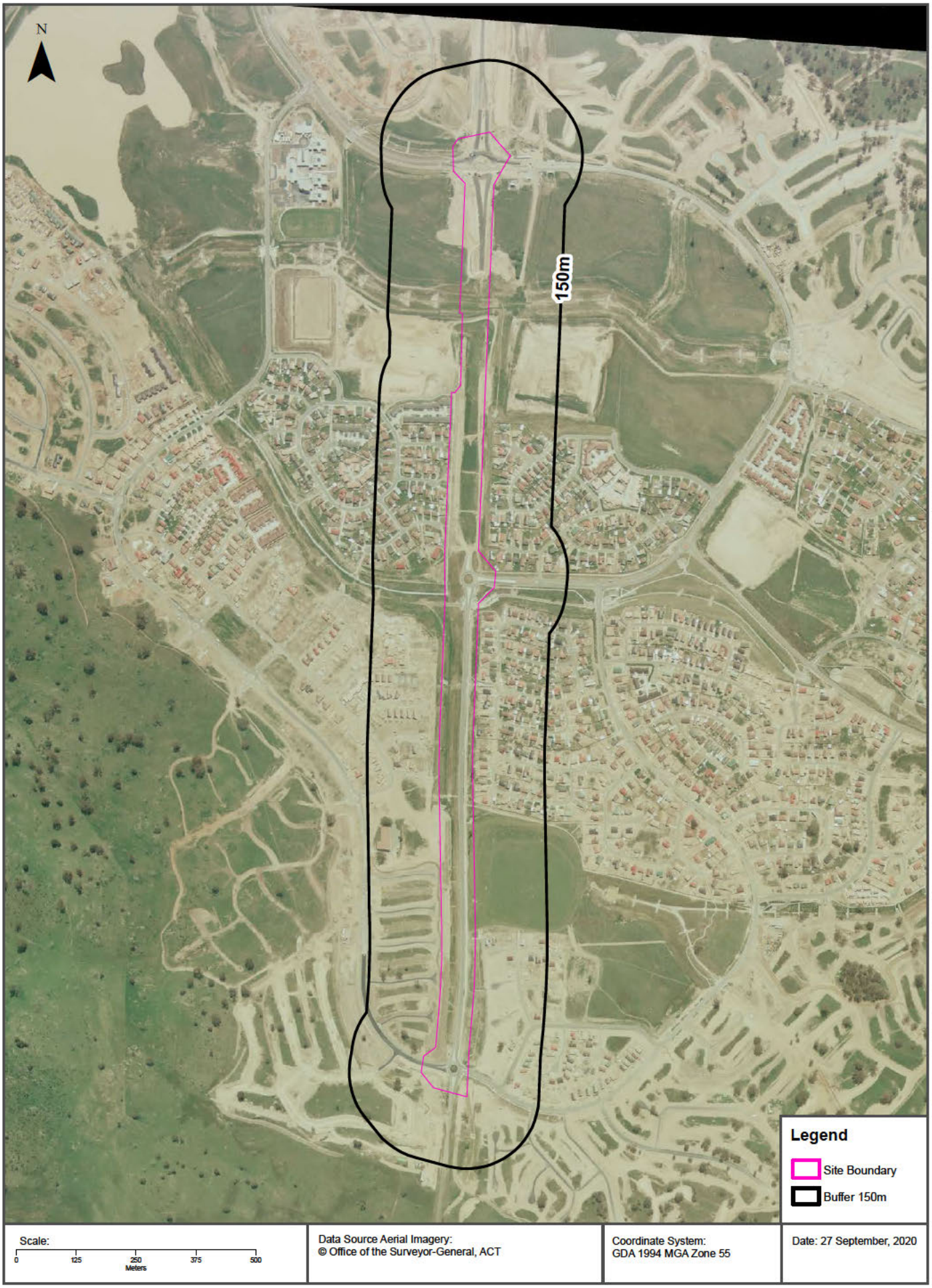
Aerial Imagery 1997

Tharwa Drive, Gordon, ACT 2906



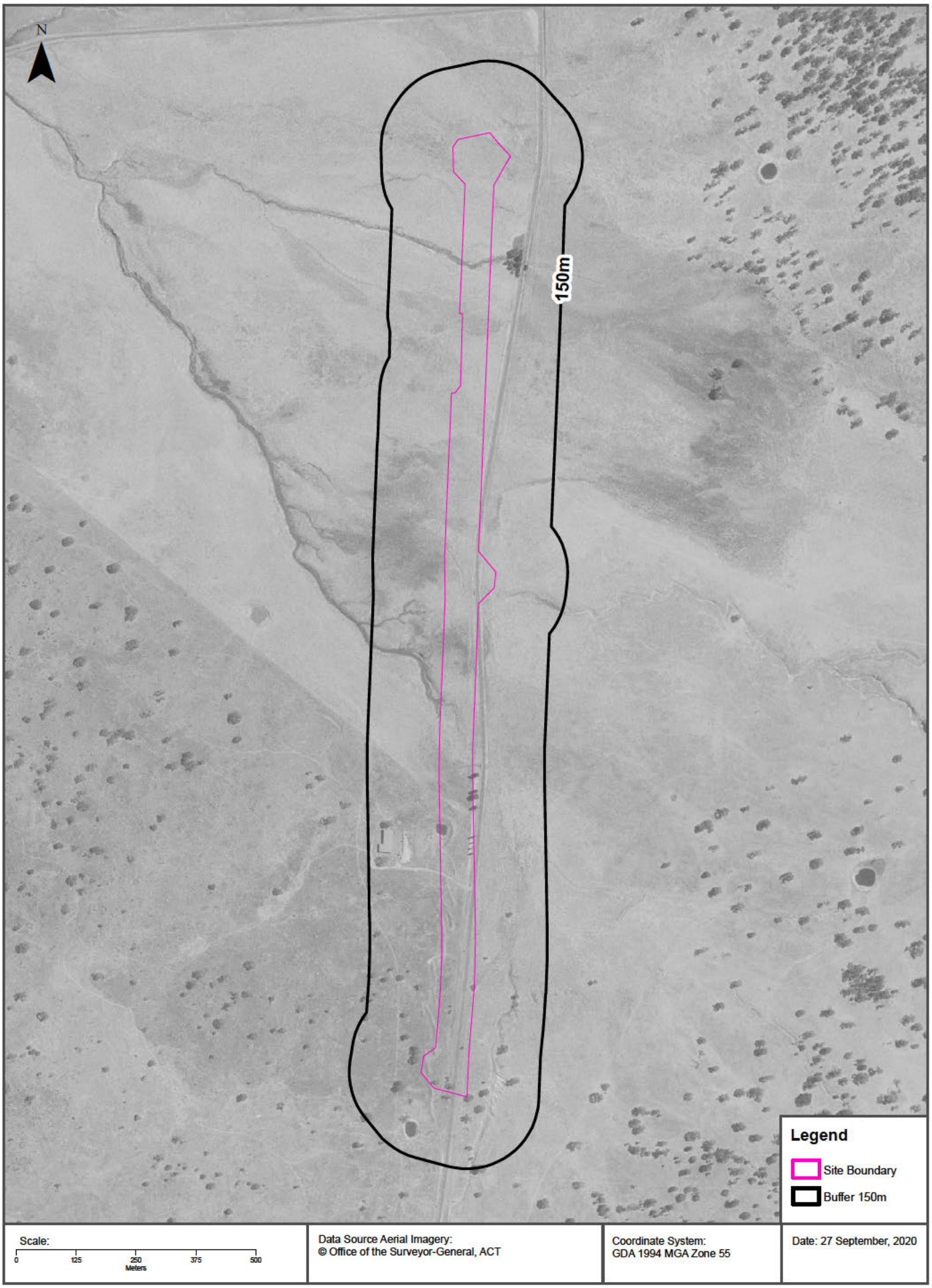
Aerial Imagery 1992

Tharwa Drive, Gordon, ACT 2906



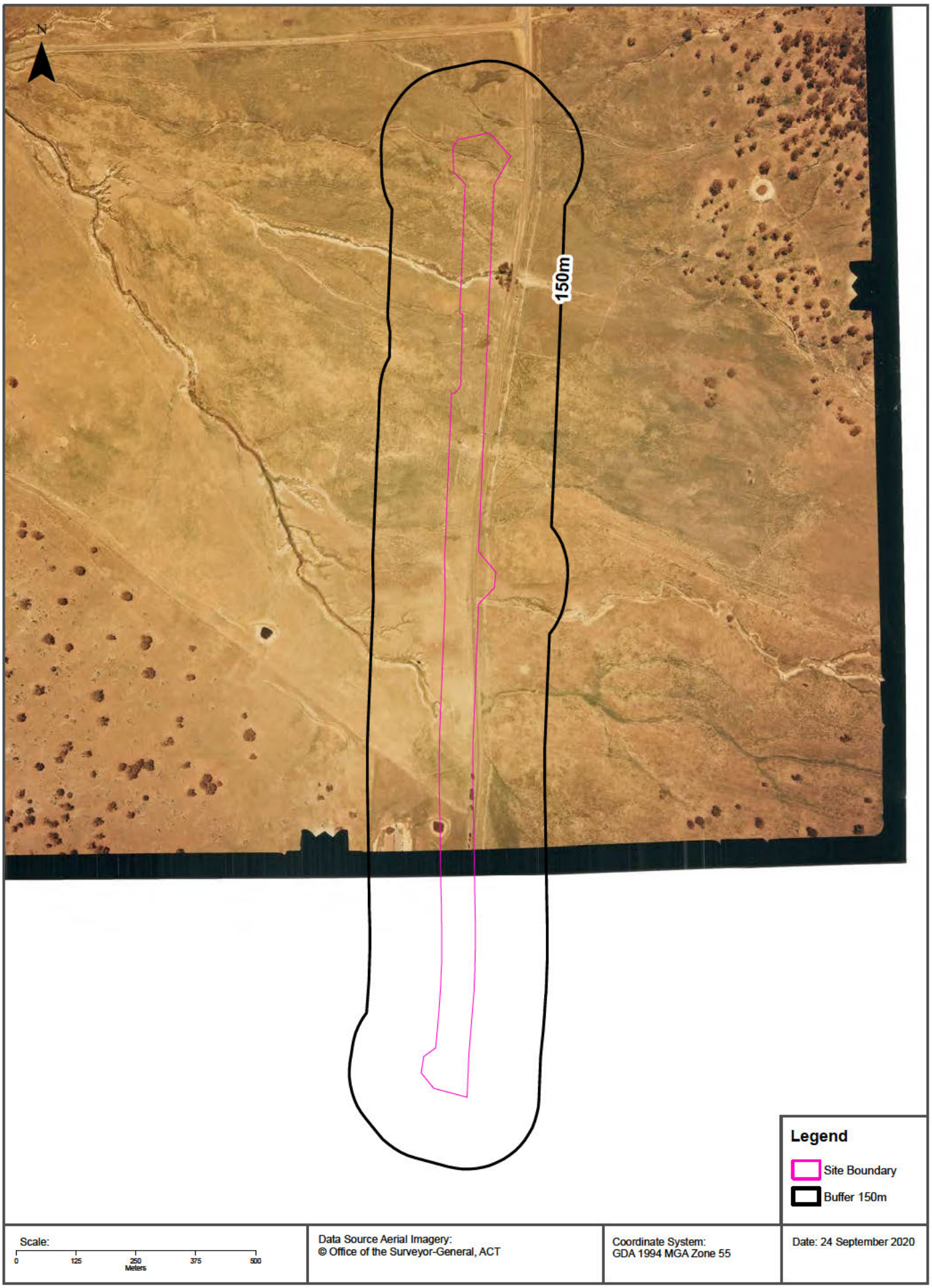
Aerial Imagery 1985

Tharwa Drive, Gordon, ACT 2906



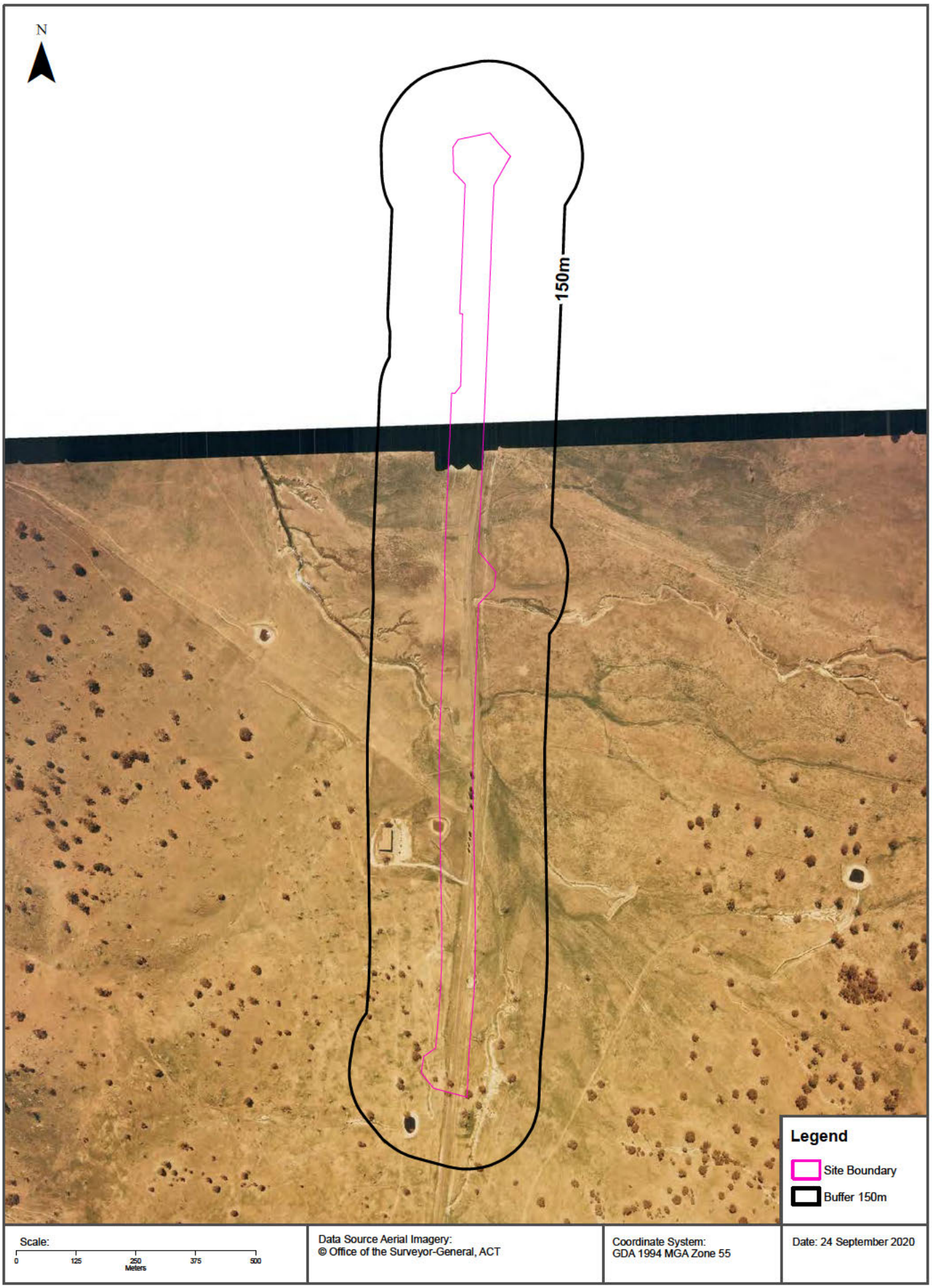
Aerial Imagery 1981

Tharwa Drive, Gordon, ACT 2906



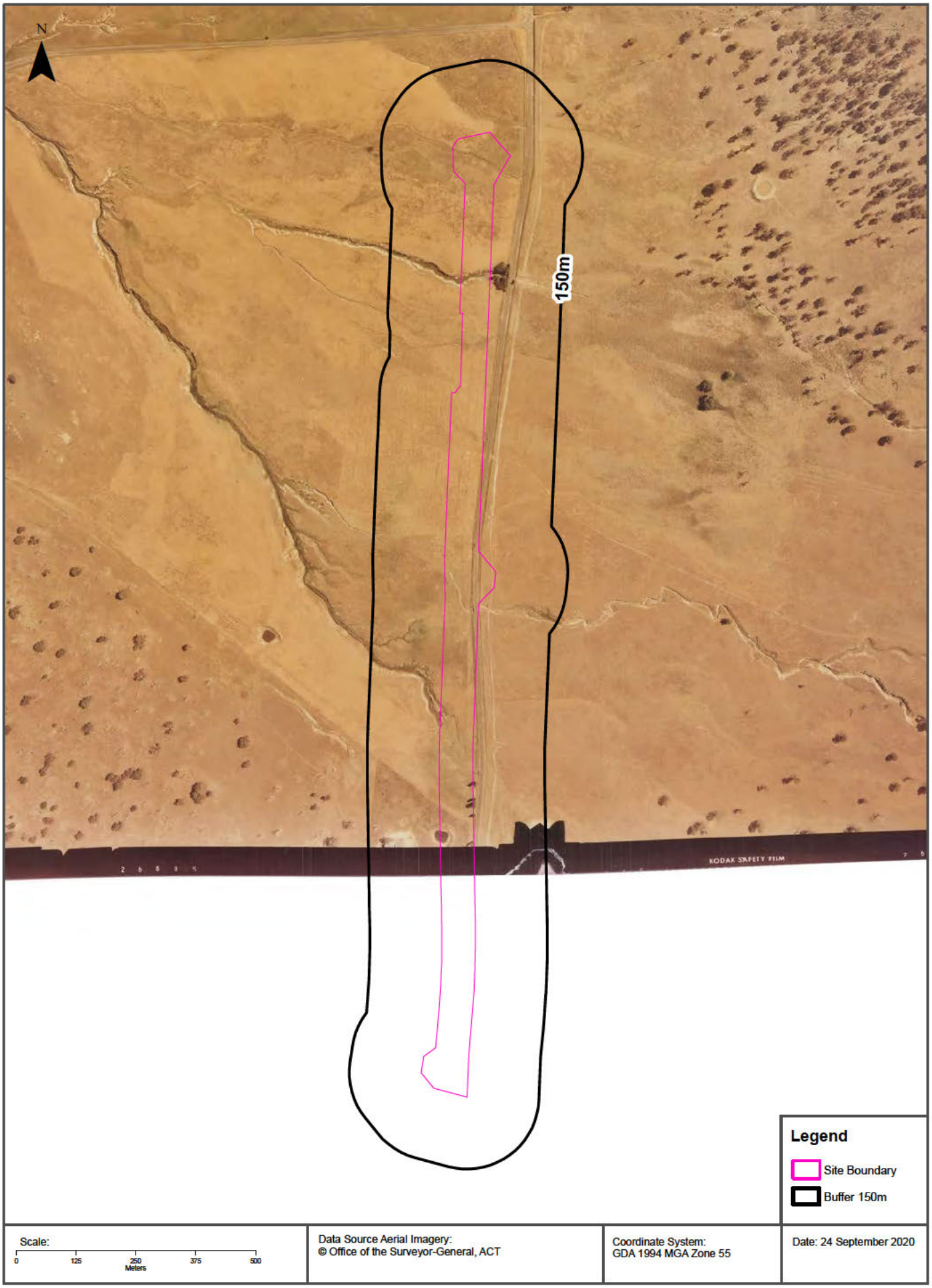
Aerial Imagery 1981

Tharwa Drive, Gordon, ACT 2906



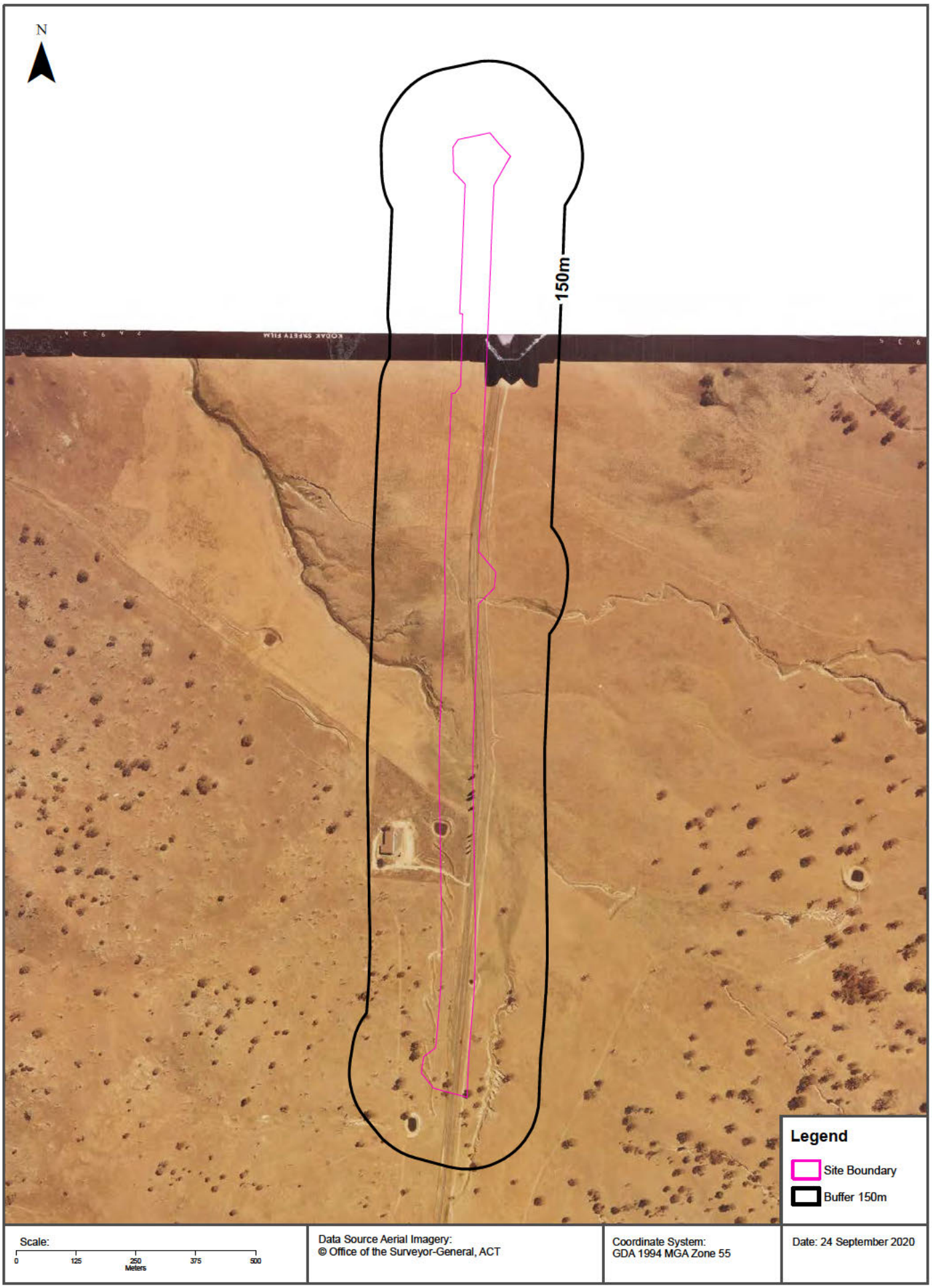
Aerial Imagery 1978

Tharwa Drive, Gordon, ACT 2906



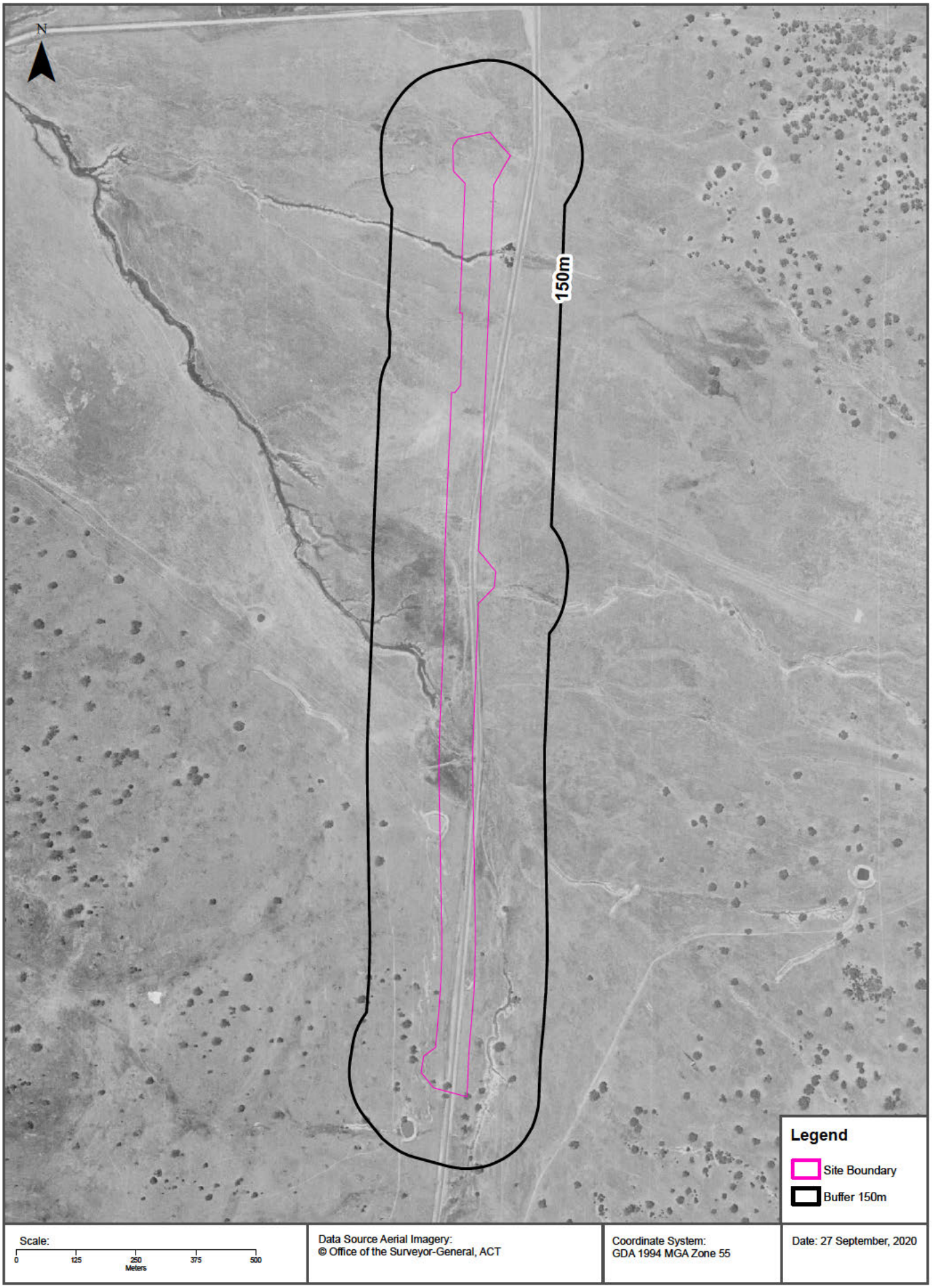
Aerial Imagery 1978

Tharwa Drive, Gordon, ACT 2906



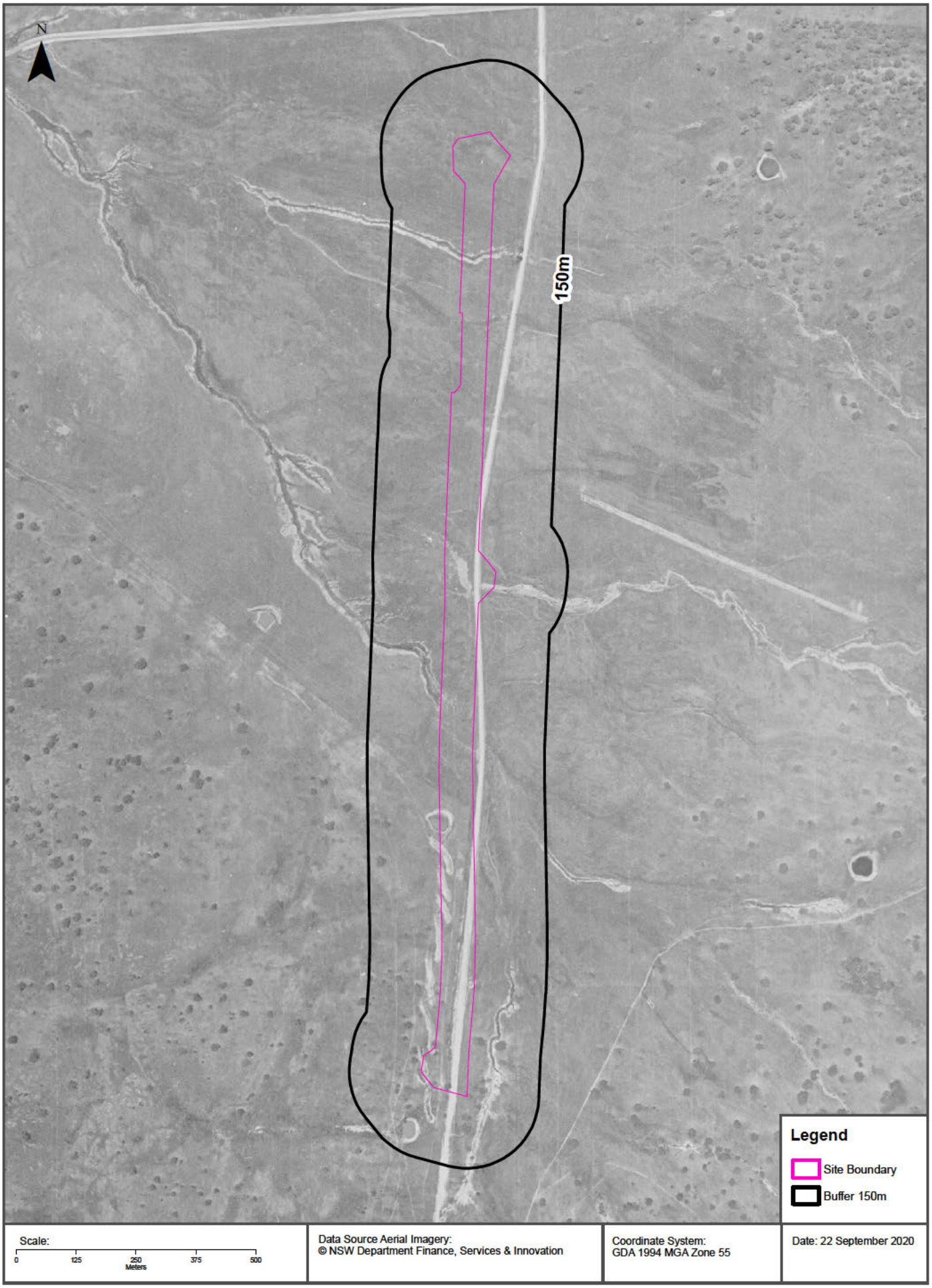
Aerial Imagery 1967

Tharwa Drive, Gordon, ACT 2906



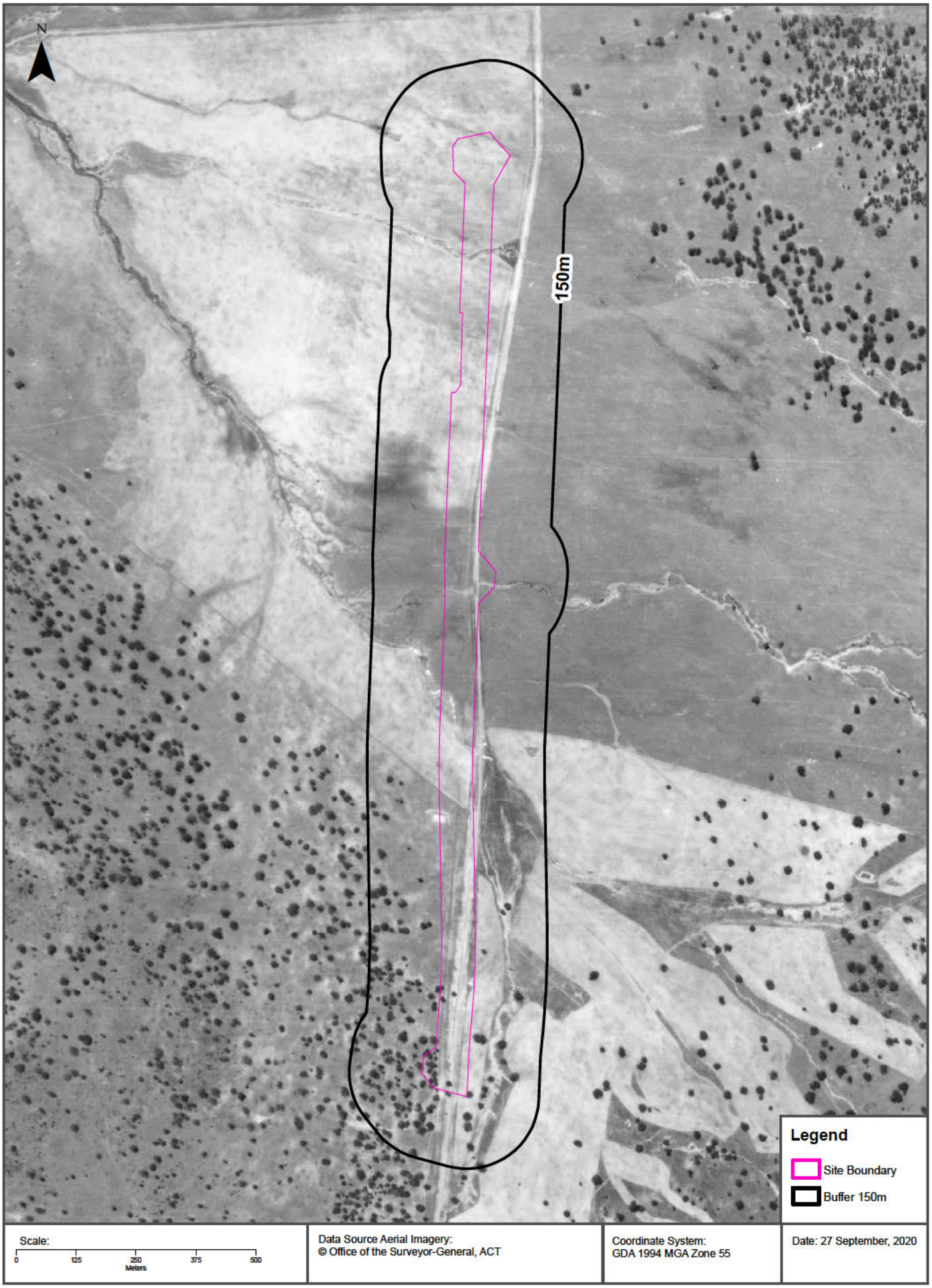
Aerial Imagery 1961

Tharwa Drive, Gordon, ACT 2906



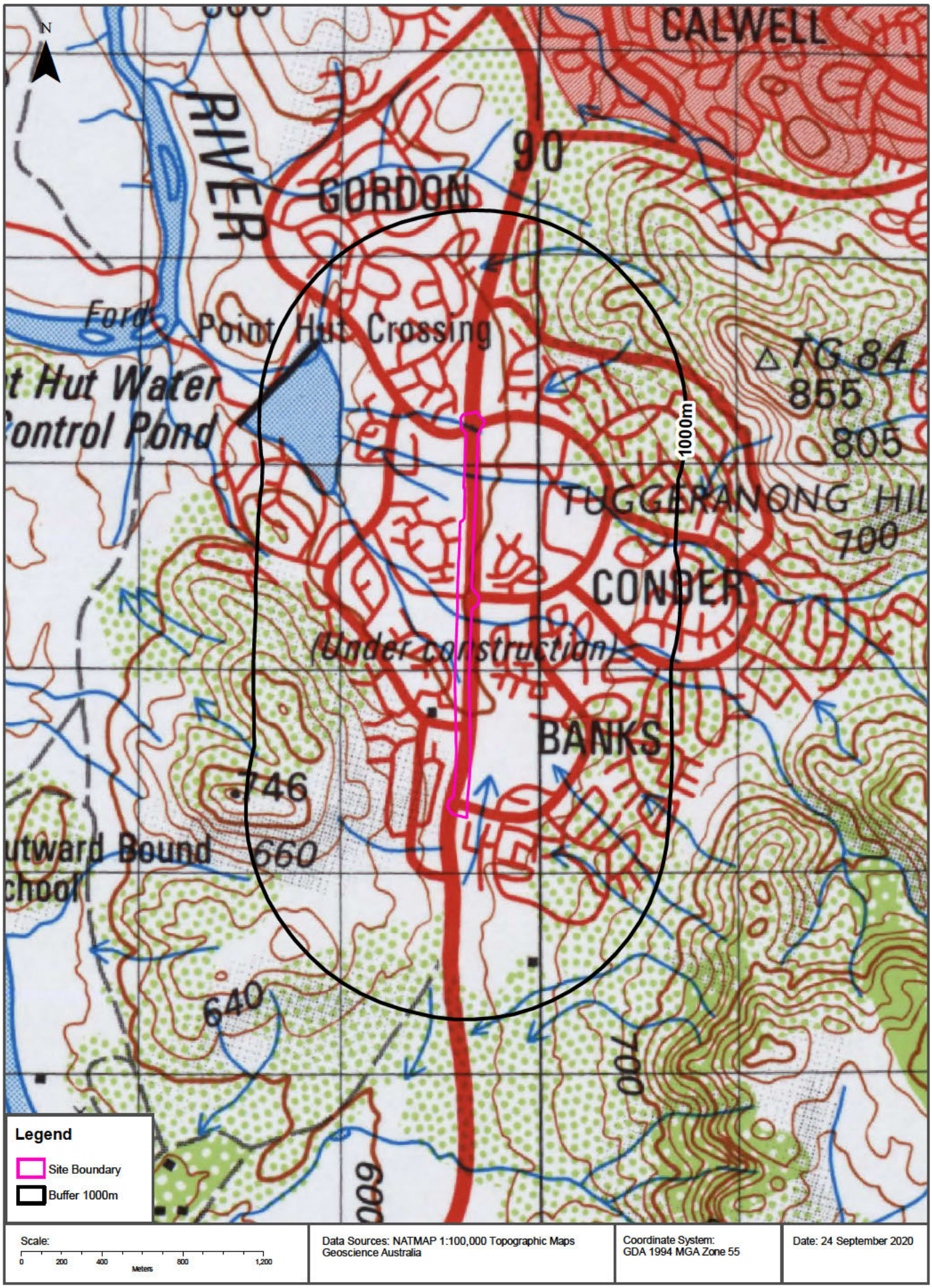
Aerial Imagery 1944

Tharwa Drive, Gordon, ACT 2906



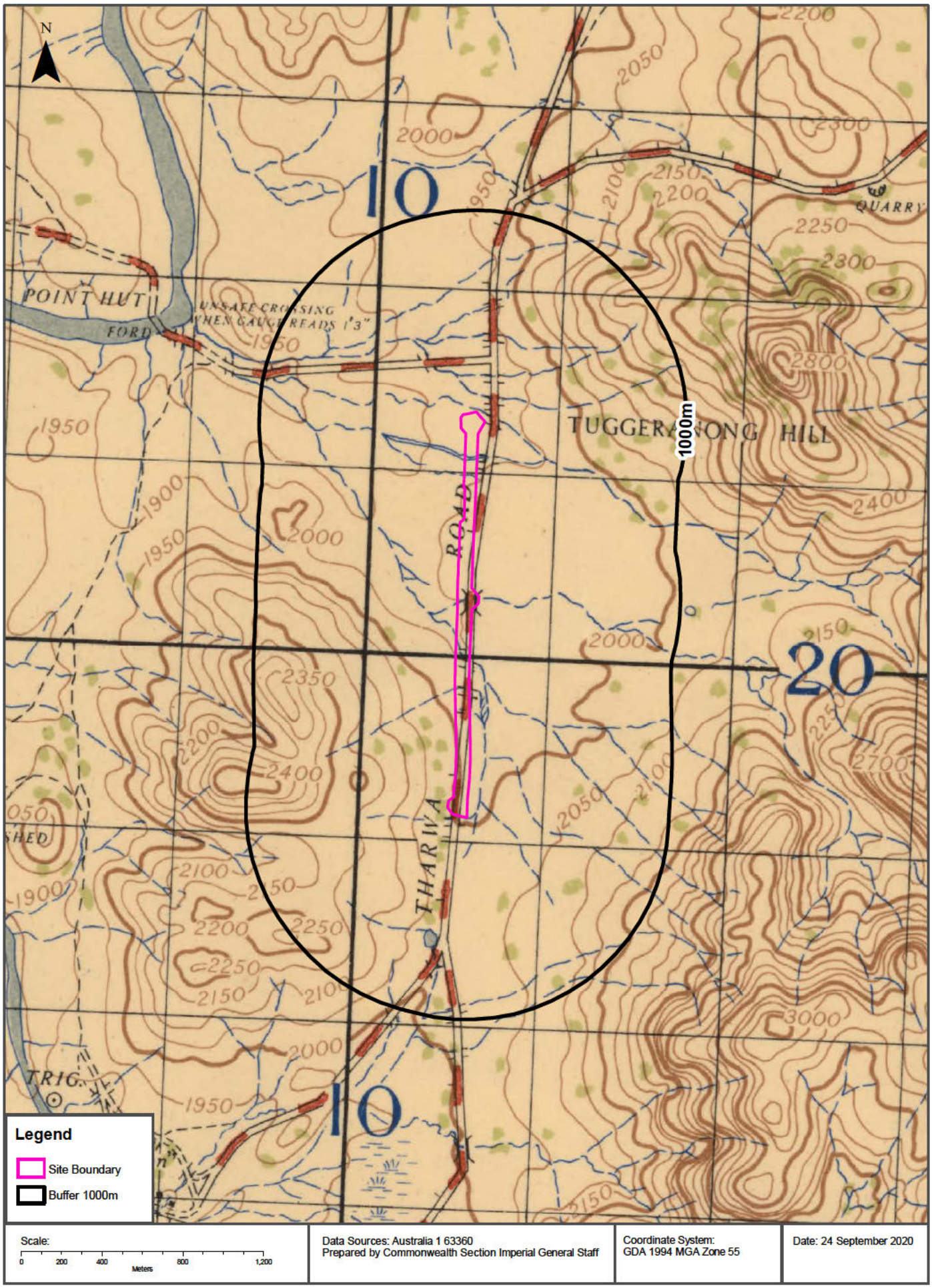
Historical Map 1987

Tharwa Drive, Gordon, ACT 2906



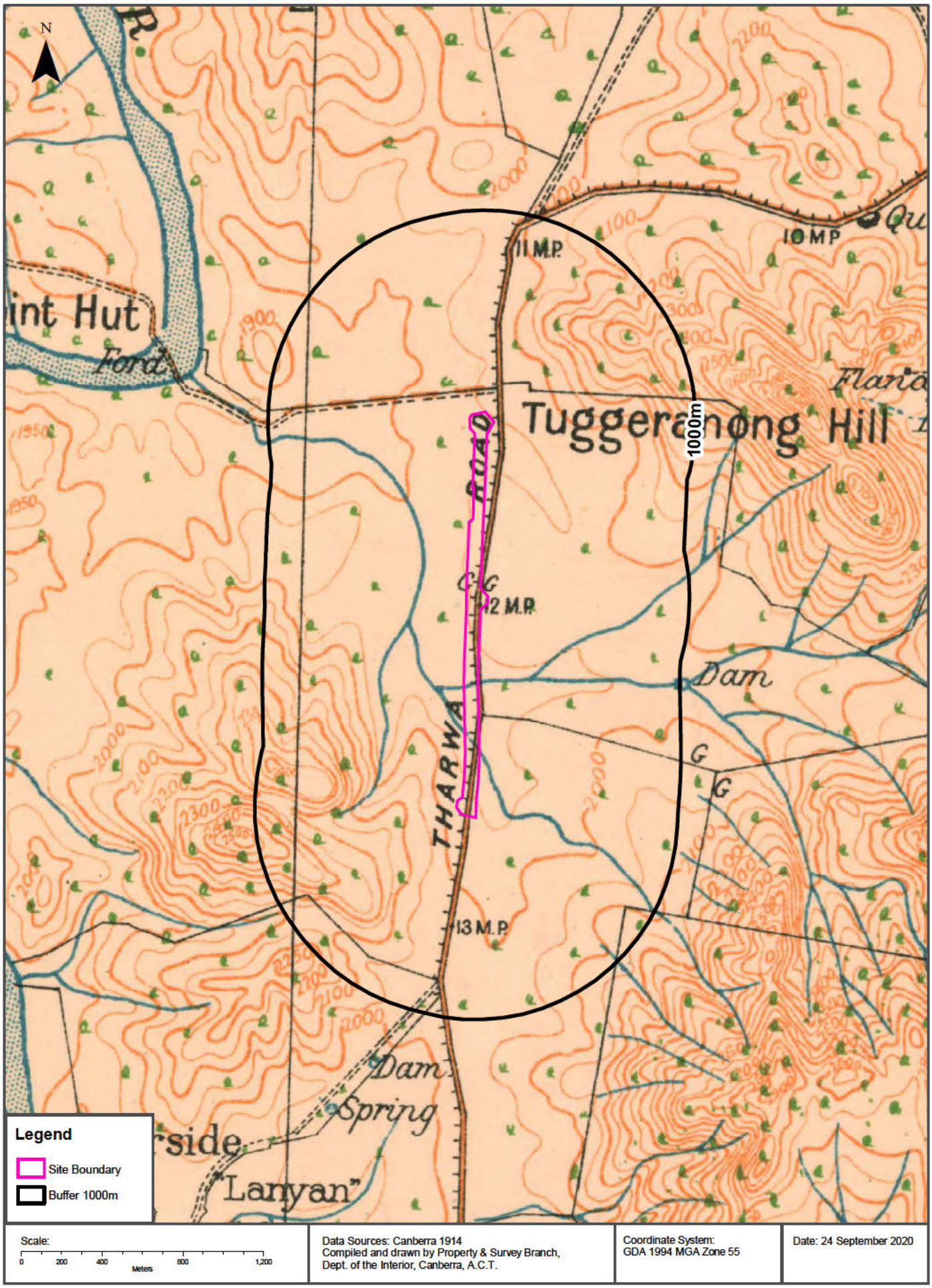
Historical Map c.1942

Tharwa Drive, Gordon, ACT 2906



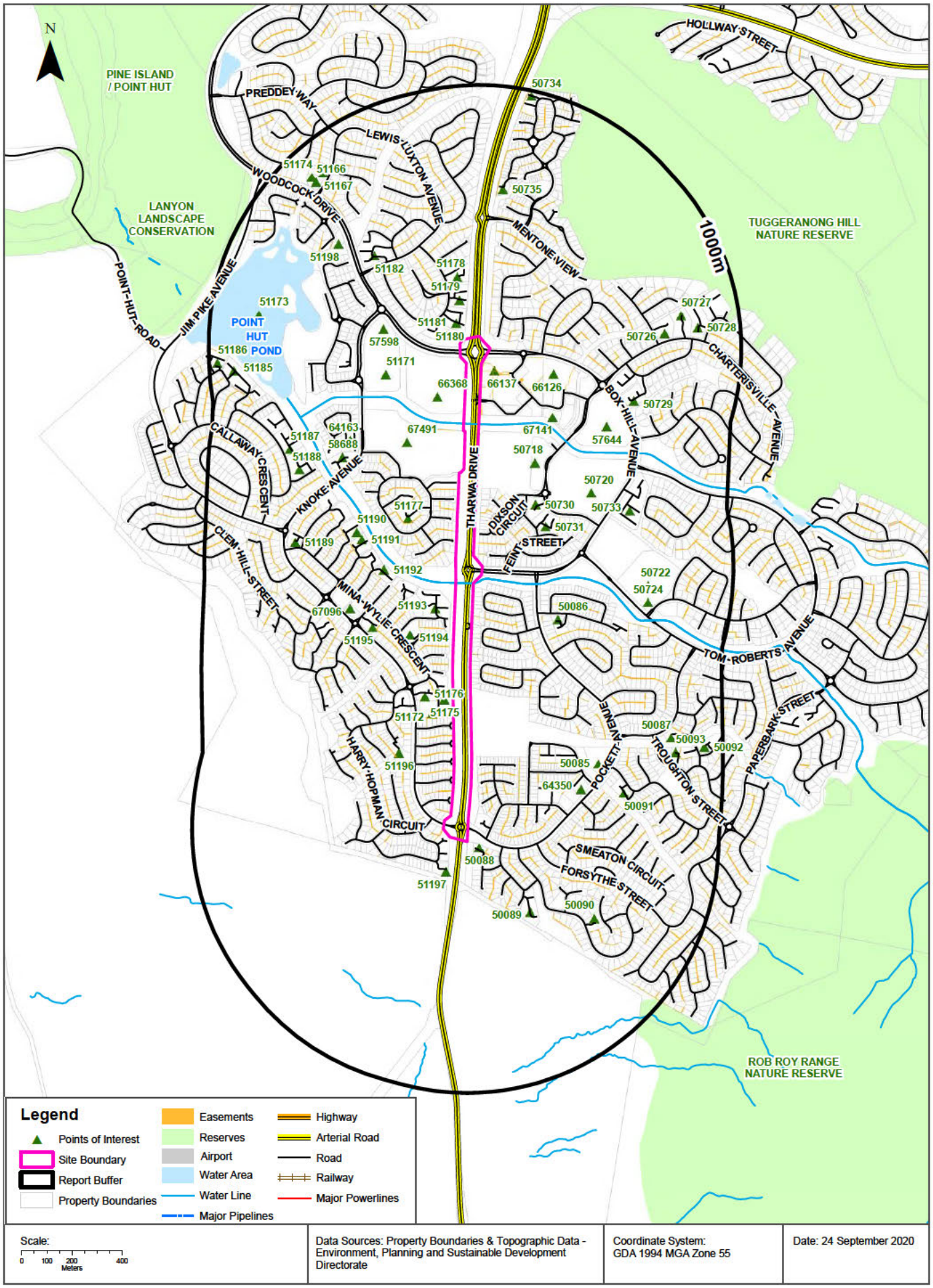
Historical Map c.1914

Tharwa Drive, Gordon, ACT 2906



Topographic Features

Tharwa Drive, Gordon, ACT 2906



Topographic Features

Tharwa Drive, Gordon, ACT 2906

Features of Interest

What Features of Interest exist within the report buffer?

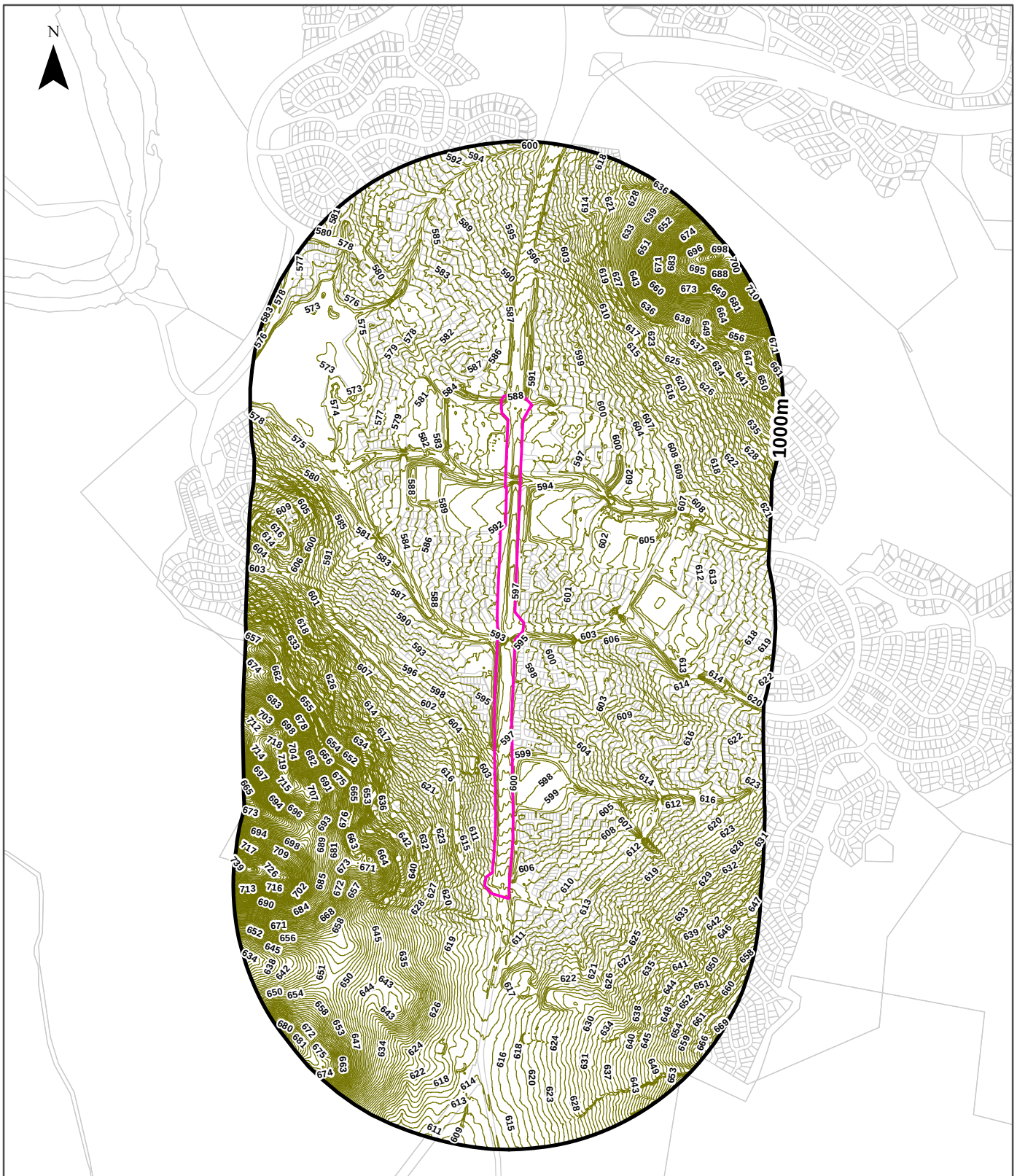
Map Id	Feature Type	Name	Description	Distance	Direction
51175	BUILDING	Lanyon Village	MULTI-UNIT DEVELOPMENT	32m	South
50088	BUILDING	Sheraton Park	MULTI-UNIT DEVELOPMENT	52m	South
66137	BUILDING	Lanyon Market Place	COMMERCIAL USE	53m	North
51181	BUILDING	Liza Court	MULTI-UNIT DEVELOPMENT	63m	North
51180	BUILDING	Gordon Grove	MULTI-UNIT DEVELOPMENT	70m	North
51193	RESERVE,PARK,NATIONAL PARK,CONSERVATION PARK,COMMON	Gordonvale Park	MULTI-UNIT DEVELOPMENT	75m	South West
51172	BUILDING	Telephone Exchange	MAJOR UTILITY INSTALLATION	82m	South
66368	BUILDING	Uniting Amala Independent Retirement Village	RETIREMENT COMPLEX, SPECIAL CARE ESTABLISHMENT	107m	North
51176	BUILDING	Grayson Terrace	MULTI-UNIT DEVELOPMENT	109m	South
51197	BUILDING	Boban Court	MULTI-UNIT DEVELOPMENT	133m	South
51179	BUILDING	Brittony Gardens	MULTI-UNIT DEVELOPMENT	157m	North
51194	BUILDING	Bentley Terrace	MULTI-UNIT DEVELOPMENT	171m	South West
51177	BUILDING	Sherwood Park	MULTI-UNIT DEVELOPMENT	193m	North West
51196	BUILDING	Nicholson Gardens	MULTI-UNIT DEVELOPMENT	217m	South
67491	BUILDING	Toilets Change Rooms	COMMUNITY USE	226m	North
50718	BUILDING	Sports Club	CLUB - ETHNIC CLUBS, FOOTBALL CLUB, LABOR CLUB, LEGUES CLUB	230m	North East
50730	BUILDING	Charles Court	MULTI-UNIT DEVELOPMENT	239m	North East
51178	BUILDING	Emerald Gardens	MULTI-UNIT DEVELOPMENT	249m	North
66126		Kalorama	MULTI-UNIT DEVELOPMENT	272m	North
50731	BUILDING	Belle Tromoto	MULTI-UNIT DEVELOPMENT	282m	North East
51192	BUILDING	Hamilton Grove	MULTI-UNIT DEVELOPMENT	282m	West
67141	BUILDING	MURA Youth and Community Centre	COMMUNITY ACTIVITY CENTRE	292m	North East
51171	BUILDING	Gordon Primary School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	302m	North
57598	BUILDING	Gordon Preschool	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	307m	North
51195	BUILDING	Hatherley Court	MULTI-UNIT DEVELOPMENT	321m	West
50086	BUILDING	Chapel Grove	MULTI-UNIT DEVELOPMENT	342m	East
51191	BUILDING	Gordon Court	MULTI-UNIT DEVELOPMENT	373m	North West
50089	BUILDING	Lanyon Gardens	MULTI-UNIT DEVELOPMENT	374m	South

Map Id	Feature Type	Name	Description	Distance	Direction
51190	BUILDING	Banksia Court	MULTI-UNIT DEVELOPMENT	395m	North West
67096	BUILDING	Mullewa	MULTI-UNIT DEVELOPMENT	413m	West
64350		Sunrise Villas	MULTI-UNIT DEVELOPMENT	438m	South East
64163	BUILDING	Gordon Valley	MULTI-UNIT DEVELOPMENT	449m	North West
50720	BUILDING	Lanyon High School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	458m	North East
58688	BUILDING	Lambrigg Park	MULTI-UNIT DEVELOPMENT	466m	North West
51182	BUILDING	Barrington Gardens	MULTI-UNIT DEVELOPMENT	484m	North
50085	RESERVE,PARK,NATIONAL PARK,CONSERVATION PARK,COMMON	Beau and Jessi Park	PARKLAND - BOTANIC GARDENS AND PUBLIC ARBORETUM	504m	South East
57644	BUILDING	ST Clare of Assisi Primary School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	509m	North East
50090	BUILDING	Woodridge	MULTI-UNIT DEVELOPMENT	589m	South
50735	BUILDING	Whiteford	MULTI-UNIT DEVELOPMENT	593m	North
50729	BUILDING	Merry Park	MULTI-UNIT DEVELOPMENT	608m	North East
50091	BUILDING	Brooklyn Gardens	MULTI-UNIT DEVELOPMENT	609m	South East
50733	BUILDING	Newstead Mews	MULTI-UNIT DEVELOPMENT	615m	North East
51198	BUILDING	Fenway Park	MULTI-UNIT DEVELOPMENT	622m	North
51188	BUILDING	Franklin Terrace	MULTI-UNIT DEVELOPMENT	633m	North West
51189	BUILDING	Gordon Vale Court	MULTI-UNIT DEVELOPMENT	637m	West
50722	BUILDING	Charles Conder Primary School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	664m	East
50724	BUILDING	Pre-School	EDUCATIONAL ESTABLISHMENT - ADULT EDUCATION CENTRE, HIGH SCH	671m	East
51187	BUILDING	Harrington Court	MULTI-UNIT DEVELOPMENT	677m	North West
50726	BUILDING	Gumwood Park	MULTI-UNIT DEVELOPMENT	697m	North East
50727	BUILDING	Ballina Gardens	MULTI-UNIT DEVELOPMENT	771m	North East
50087	BUILDING	Namoi Gardens	MULTI-UNIT DEVELOPMENT	795m	South East
51173	RESERVOIR, PONDAGE, ARTIFICIAL LAKE	Point Hut Pond	UNCATEGORIZED	805m	North West
50093	BUILDING	Regent Gardens	MULTI-UNIT DEVELOPMENT	812m	South East
50728	BUILDING	The Belle View	MULTI-UNIT DEVELOPMENT	830m	North East
51166	BUILDING	Gordon Shops	COMMERCIAL USE	855m	North
51167	BUILDING	Childcare Centre	CHILD CARE CENTRE - ADJUNCT CARE, CRECHE, LONG DAY CARE	864m	North
51174	BUILDING	Medical Centre	HEALTH FACILITY - BABY HEALTH CLINIC, CONSULTING ROOM	881m	North
51185	BUILDING	Point Hut Shores	MULTI-UNIT DEVELOPMENT	899m	North West
50092	BUILDING	Nolan Gardens	MULTI-UNIT DEVELOPMENT	927m	South East
51186	BUILDING	Brindabella Bay	MULTI-UNIT DEVELOPMENT	964m	North West
50734	BUILDING	Jordan Gardens	MULTI-UNIT DEVELOPMENT	978m	North

Features of Interest Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Elevation Contours (2015 - 1m)

Tharwa Drive, Gordon, ACT 2906



Legend

- Site Boundary
- Report Buffer
- Property Boundaries
- Elevation Contour (m)

Automatically generated 1m contours of the ACT derived from 1m hydro-flattened DEM. Major lakes and dams within the ACT were assigned an elevation to produce a hydro-flattened DEM. 1m DEMs derived from 4ppm and 8ppm LiDAR were used as the input DEMs and polygons of major water bodies were used to determine the extent of lakes within the DEM extent. The input DEM defines the classified Australian Height Datum (AHD) LiDAR point cloud data as a 1 meter Digital Elevation Model (DEM). The Water Features data were digitised in 1995 from the following map sources - 1:10,000 Plan Series, 1:2,500 Cadastre, 1:2,500 Detail, 1:1,000 Detail and traced from Topobase. The mean elevation of each of these polygons was used to hydro -flatten the corresponding water bodies in the DEM. Contours were generated from the DEM using ESRI ArcGIS Contour tool.

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System: GDA 1994 MGA Zone 55

Date: 24 September 2020

Hydrogeology & Groundwater

Tharwa Drive, Gordon, ACT 2906

Hydrogeology

Description of aquifers on-site:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Description of aquifers within the report buffer:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Hydrogeological Landscapes Units

Unit No	Landscape Name	Land Salinity	Stream Salinity	Stream EC	Salt Store	Salt Availability	Salt Mobility	Hazard Impact	Hazard Likelihood	Hazard Overall	Distance	Direction
13	Lanyon	Low	Low	Low	Moderate	Moderate	Moderate	Limited	Moderate	Low	0m	Onsite

Hydrogeological Landscapes Units Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Hydrogeology & Groundwater

Tharwa Drive, Gordon, ACT 2906

Groundwater Boreholes (ACT)

Please note that this dataset does not include investigation and/or monitoring bores associated with possible contaminated sites in the search area. If you require more information please contact the Environmental Quality team via email environment.protection@act.gov.au or phone via Access Canberra 13 22 81.
Boreholes from an ACT Government Data Source within 2km of the site:

Bore Id	Bore Type	Method	Date	Bore Depth To	Bit Diameter	1st Water Intersection Depth From	1st Water Intersection Depth To	Final Static GW Level IM	1st Est Yield	Final Yield	Dist	Direction
139	Abstraction	Rotary Air	28/06/2009	144.00	200	50.0	51.0	10.00	0.25	0.57	96m	North

Boreholes (ACT) Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Hydrogeology & Groundwater

Tharwa Drive, Gordon, ACT 2906

Groundwater Boreholes (Bureau of Meteorology)

Boreholes (Bureau of Meteorology) within 2km of the site:

Hydro ID	State Bore ID	Drilled Date	Final Depth	Drilled Depth	Elevevation	Distance	Direction
80000763	551	28/06/2009	144.00	144.00	595.69	96m	North
10013735	410778				557.10	1547m	North West
10013088	41010254				555.98	1604m	North West

Borehole Data Source : © Commonwealth of Australia (Bureau of Meteorology) . Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Driller's Logs (Bureau of Meteorology)

Drill log data relevant to the Boreholes (Bureau of Meteorology) within 2km of the site:

Hydro ID	State Bore ID	Drillers Log	Distance	Direction
No related drill log data				

Drill Log Data Source: © Commonwealth of Australia (Bureau of Meteorology) .
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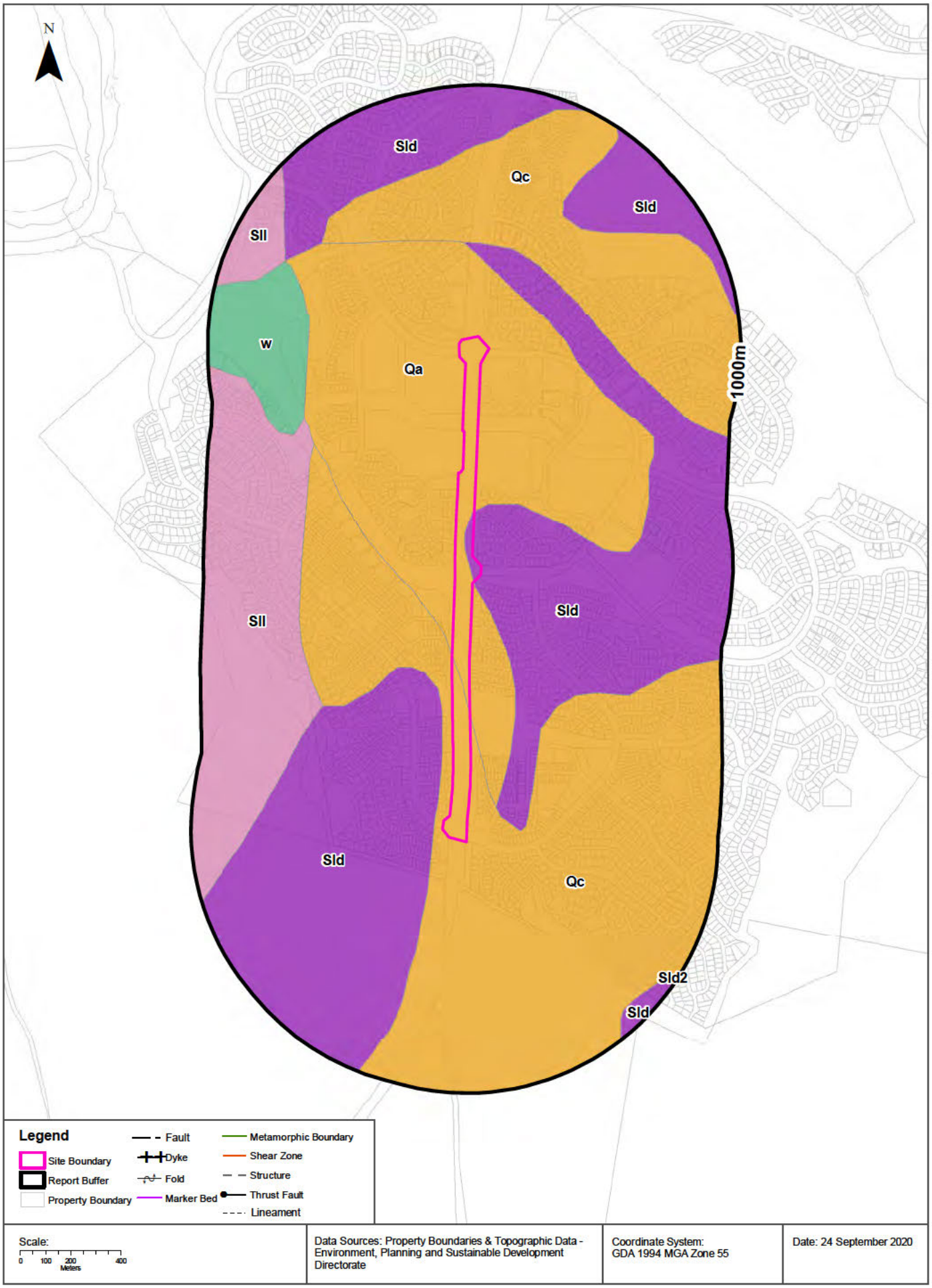
Geology 1:250,000

Tharwa Drive, Gordon, ACT 2906



Geology

Tharwa Drive, Gordon, ACT 2906

Geological Units (1:250,000 scale)

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Member	Era	Period	Dataset
Qa	Alluvium, fluvial deposits: gravel, sand, silt and clay	undifferentiated	unknown			Cainozoic	Quaternary	1:250,000
Qc	Fanglomerate and poorly cemented conglomerate, gravel and sand: colluvium	unnamed	unknown			Cainozoic	Quaternary	1:250,000
Sld	Rhyodacitic ignimbrite and minor volcaniclastic and argillaceous sediments	Deakin Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000

What are the Geological Units within the report buffer?

Symbol	Description	Unit Name	Group	Sub Group	Member	Era	Period	Dataset
Qa	Alluvium, fluvial deposits: gravel, sand, silt and clay	undifferentiated	unknown			Cainozoic	Quaternary	1:250,000
Qc	Fanglomerate and poorly cemented conglomerate, gravel and sand: colluvium	unnamed	unknown			Cainozoic	Quaternary	1:250,000
Sld	Rhyodacitic ignimbrite and minor volcaniclastic and argillaceous sediments	Deakin Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000
Sld2	Tuffaceous and quartz sandstone and minor shale	Deakin Volcanics	Laidlaw Volcanic Suite		unnamed member	Palaeozoic	Silurian	1:250,000
Sll	Dark to light grey porphyritic rhyodacite ignimbrite	Laidlaw Volcanics	Laidlaw Volcanic Suite			Palaeozoic	Silurian	1:250,000
w	Water	water	water			Cainozoic	Quaternary	1:250,000

Geological Structures (1:250,000 scale)

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

What are the Geological Structures within the report buffer?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

Geological Data Source : NSW Department of Industry, Resources & Energy
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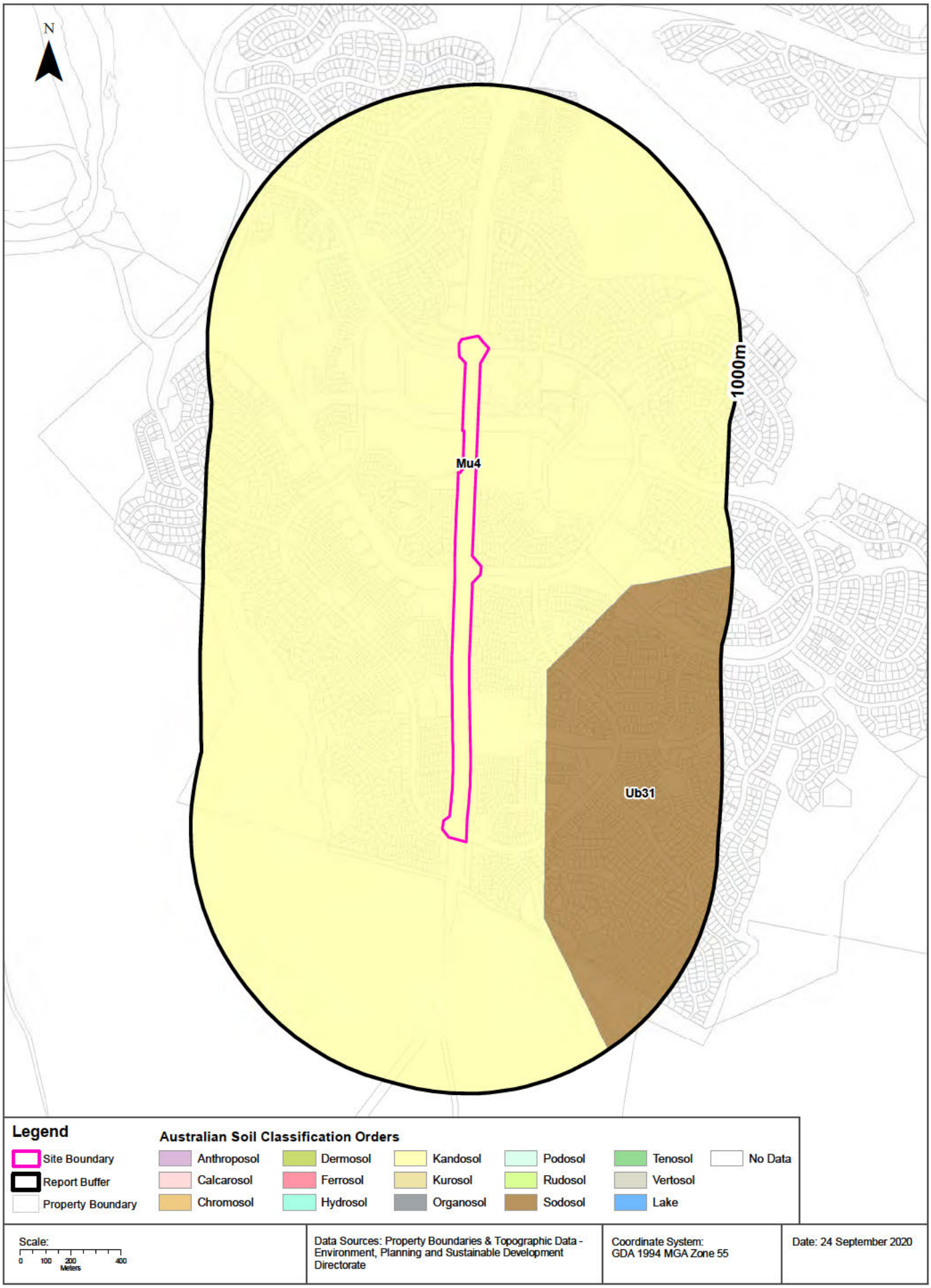
Atlas of Australian Soils

Tharwa Drive, Gordon, ACT 2906



Soils

Tharwa Drive, Gordon, ACT 2906

Atlas of Australian Soils

Australian soil types within the dataset buffer:

Symbol	Soil Order	Map Unit Description	Distance
Mu4	Kandosol	Gen ly to strongly undulating plains at moderate to low elevations (<2000 ft) with basins, stream terraces, and low residual hills and ridges; buried, layered soil materials are present: undulating plains of neutral leached red earths (Gn2.15) in the better-drained sites and yellow earths (Gn2.25) in intermediate drainage situations, with yellow leached earths (Gn2.75) often associated with hard neutral and/or alkaline yellow mottled soils (Dy3.42 and Dy3.43) in poorly drained areas, swampy sites, and seepage situations--all often with heavy clay D horizons below the solum. Associated are: low residual hills and ridges of (Dr2.22 and Dr2.42) or (Dy3.22 and Dy3.42) soils, with small areas of (Um4.2) soils and rock outcrops; basins of (Gn2.15 and Gn2.25) or (Dy3.42) soils; and stream terraces of variable width and development with (Um1) soils on present flood-plains, (Um6.11) soils on the youngest terraces, (Gn2.15, Gn2.25, and Gn2.75) in drainage sequence from well-drained to poorly drained sites on the next, and most extensive, terrace, adjacent to which sand sheets of (Uc1.2) soils may occur; (Dr2.42), (Dy3.42), and (Dy3.43) soils on remnants of the highest terrace, above which gravel fills and ironstone slabs may occur.	0m
Ub31	Sodosol	Low step-like range country--stepped rolling country wi h scarps, hills, and valleys: chief soils are hard neutral yellow and yellow mottled soils (Dy3.42), (Dy2.42), (Dy2.22), and (Dy3.22) with a variety of other (D) soils and some (Gn2) and (Um4) soils, generally associated as follows: irregularly spaced cuesta-like ranges with (i) moderate to steep scarps of rock outcrops, (Um4.1), (Dr3.42), (Dr2.22), and other (D) soils passing to (iia) long rolling back slopes of (Dy3.42), (Dy2.42), (Dy3.22) with (Dr2.22 and Dr2.42) and sometimes (Gn2.1 and Gn2.2) soils hrough the mid and upper slope positions, which in turn merge with (iib) undulating basins of (Dy3.42 and Dy3.43) soils sometimes with (Gn2.7) soils, and gullies of (Dy3.42) and/or (Gn2.7) and (Gn2.9) soils; this sequence may be broken by (iii) hills and mountains with slopes and/or scarps of (Um4.1), (Um4 2), (Dr2.21), (Dy3.41), and other (D) soils, also sometimes with belts of partially dissected upland basins of (Dy3.42) soils along the crests--i.e. with areas similar to (iib) but at a relatively higher elevation (compare unit Ub38); the whole area is traversed by (iv) narrow stream valleys of (Um1) soils on flood-plains, (Um6.11) and (Gn2) soils respectively on the next two terraces; and finally there are (v) minor occurrences of other soils, such as (Dr4.12) (e.g. Red Hill) and (Db3.12) on some basaltic areas. Saline patches are fairly common in low-lying situations, especially the (iib) areas.	300m

Atlas of Australian Soils: CSIRO
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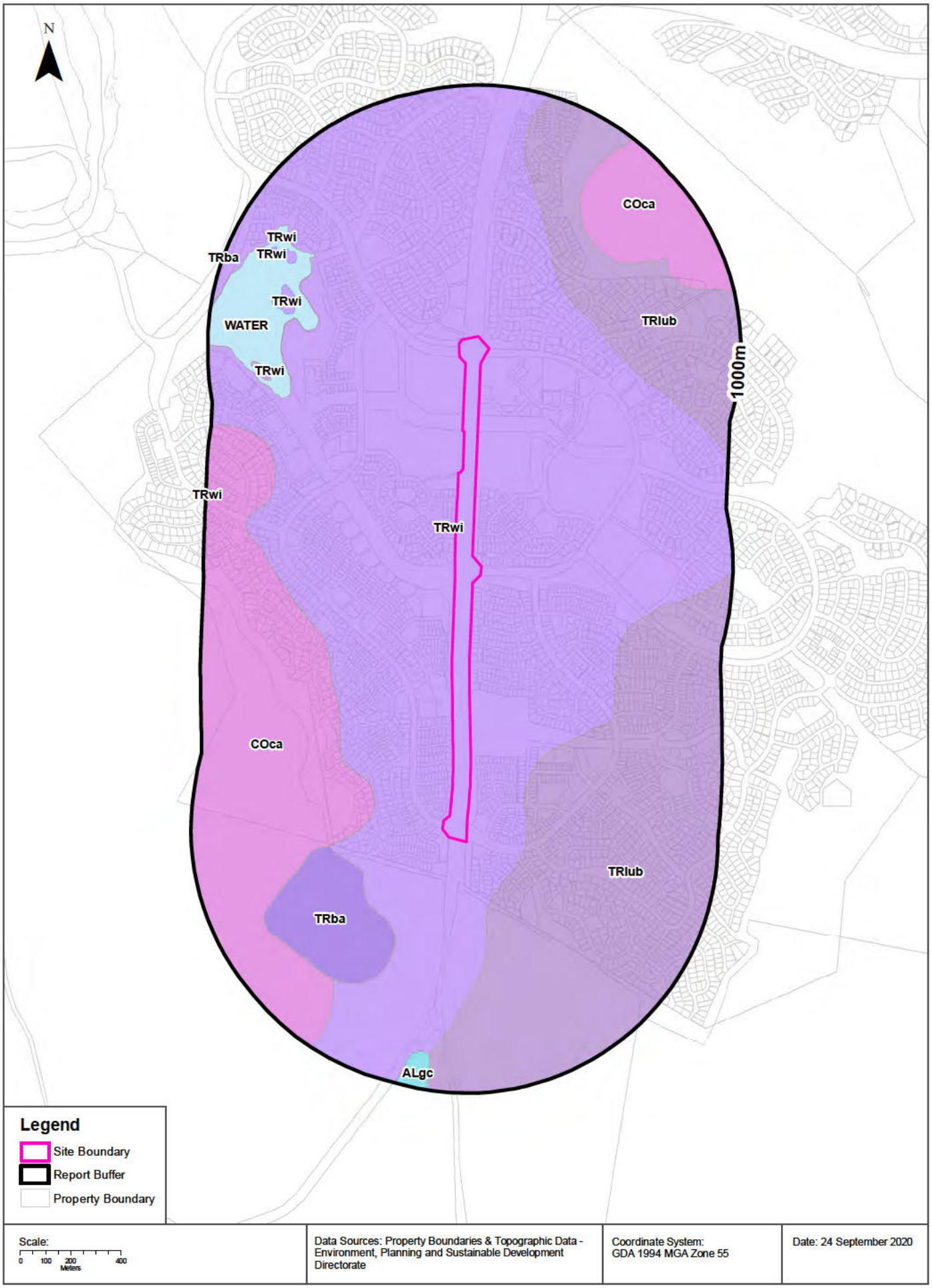
Soil Landscapes

Tharwa Drive, Gordon, ACT 2906



Soils

Tharwa Drive, Gordon, ACT 2906

Soil Landscapes

What are the onsite Soil Landscapes?

Soil Code	Name	Group	Process	Map Sheet	Scale
TRwi	WILLIAMSDALE		TRANSFERRAL	Canberra	1:100,000

What are the Soil Landscapes within the report buffer?

Soil Code	Name	Group	Process	Map Sheet	Scale
ALgc	GINNINDERRA CREEK		ALLUVIAL	Canberra	1:100,000
COca	CAMPBELL		COLLUVIAL	Canberra	1:100,000
TRba	BURRA		TRANSFERRAL	Canberra	1:100,000
TRlub	LUXOR variant b		TRANSFERRAL	Canberra	1:100,000
TRwi	WILLIAMSDALE		TRANSFERRAL	Canberra	1:100,000
WATER	WATER		WATER	Canberra	1:100,000

Soils Landscapes Data Source : NSW Office of Environment and Heritage
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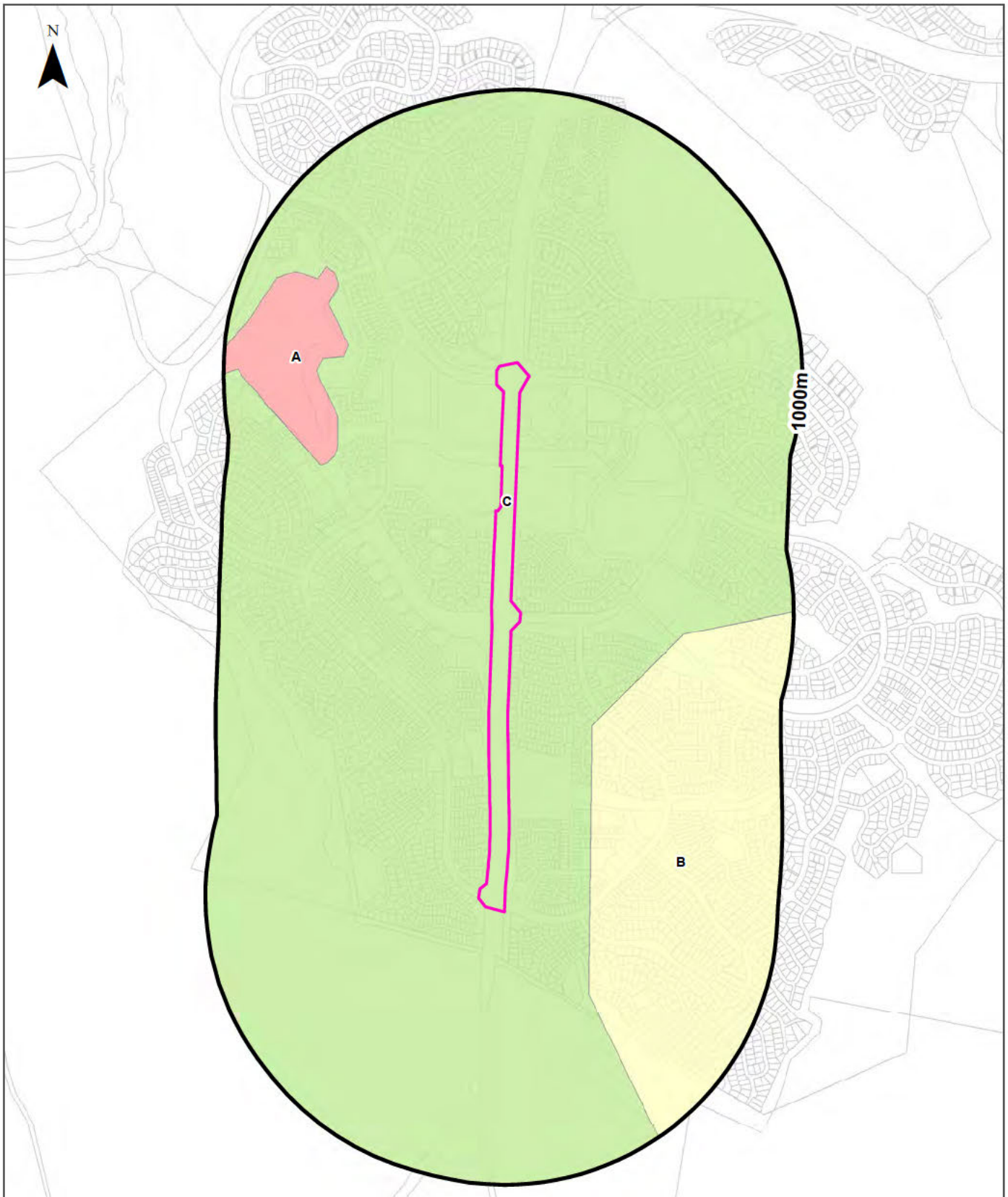
Atlas of Australian Acid Sulfate Soils

Tharwa Drive, Gordon, ACT 2906



Legend

Site Boundary
Report Buffer
Property Boundary

Probability of occurrence of Acid Sulfate Soils

A. High (>70%)
B. Low (6-70%)
C. Extremely Low (1-5%)
D. No Chance (0%)
No Data

Scale: 0 100 200 400 600 800 1,000 Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System: GDA 1994 MGA Zone 55

Date: 24 September 2020

Acid Sulfate Soils

Tharwa Drive, Gordon, ACT 2906

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m
B	Low Probability of occurrence. 6-70% chance of occurrence.	299m
A	High Probability of occurrence. >70% chance of occurrence.	548m

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO
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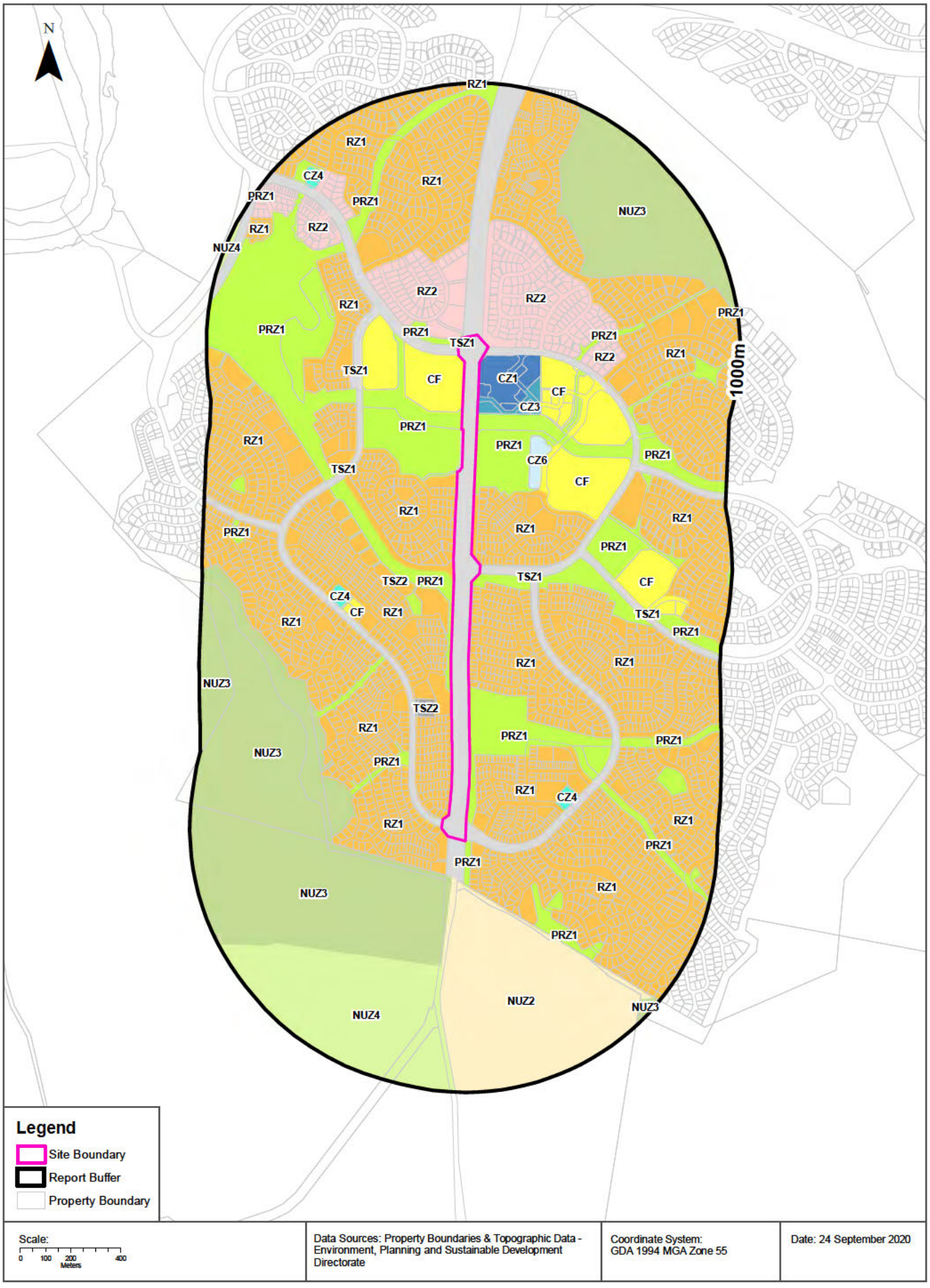
Territory Plan Zones

Tharwa Drive, Gordon, ACT 2906



Planning

Tharwa Drive, Gordon, ACT 2906

Territory Plan Zones

What Plan Zones exist within the report buffer?

Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	0m	Onsite
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	0m	Onsite
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	0m	Onsite
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	North
RZ2	SUBURBAN CORE	reflects new block boundary	TP 2008	NI2008-27	31/03/2008	0m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	0m	Sou h East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	0m	North West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	0m	Sou h West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	0m	Sou h
RZ1	SUBURBAN	Polygon was corrected to avoid overlap	TP 2008	NI2008-27	31/03/2008	0m	North East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	0m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	Sou h
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	Sou h
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	0m	North East
CZ1	CORE ZONE		TP 2008	NI2008-27	31/03/2008	0m	North
CZ3	SERVICES ZONE		TP 2008	NI2008-27	31/03/2008	0m	North
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	5m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	19m	Sou h
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	24m	Sou h East
TSZ2	SERVICES		TP 2008	NI2008-27	31/03/2008	61m	Sou h
NUZ3	HILLS, RIDGES AND BUFFER AREAS		TP 2008	NI2008-27	31/03/2008	150m	Sou h West
NUZ2	RURAL		TP 2008	NI2008-27	31/03/2008	151m	Sou h
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	164m	Sou h West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	169m	Sou h West
TSZ2	SERVICES		TP 2008	NI2008-27	31/03/2008	203m	West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	214m	North East
CZ6	LEISURE AND ACCOMMODATION		TP 2008	NI2008-27	31/03/2008	214m	North East

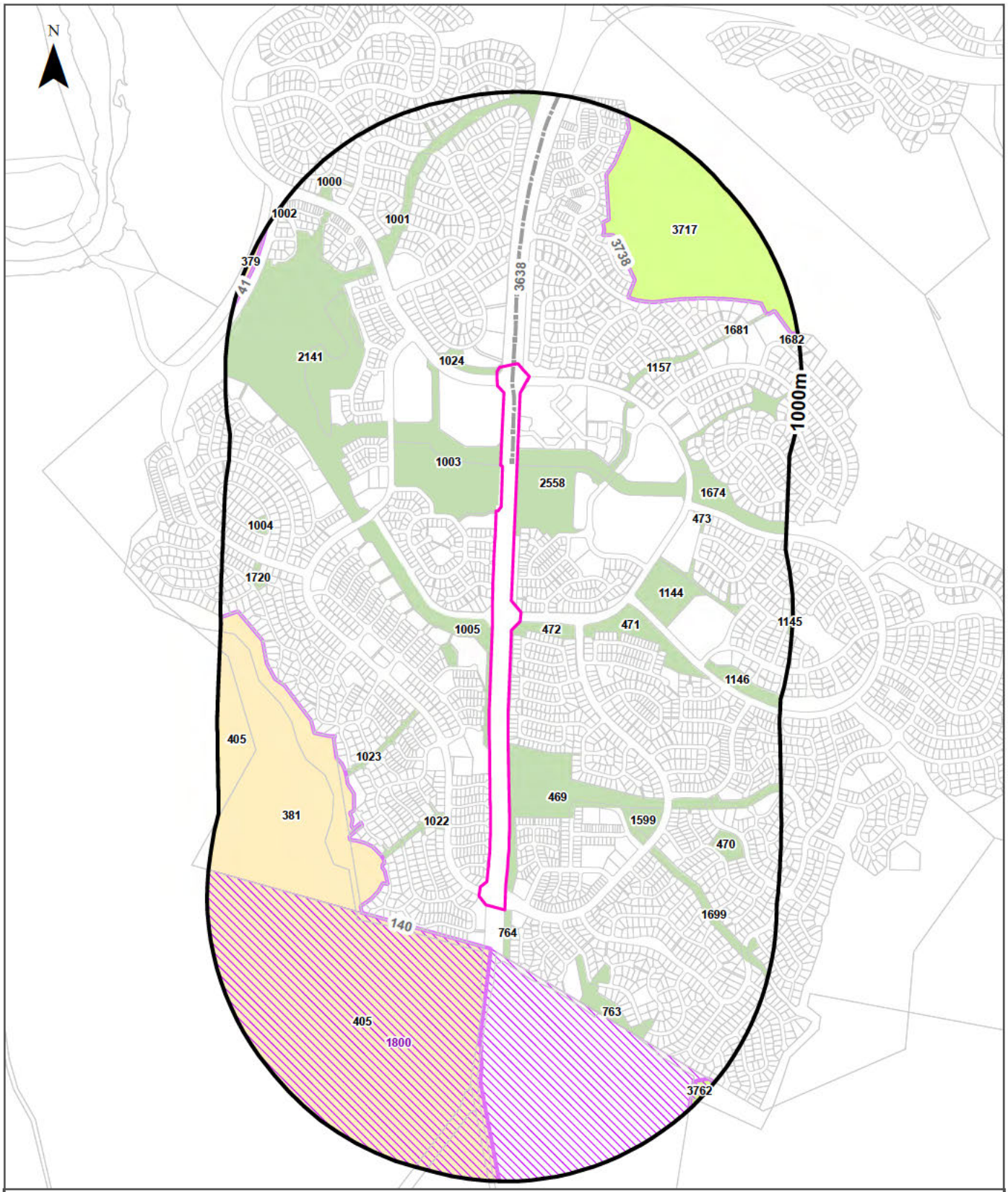
Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	234m	East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	238m	Sou h East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	239m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	256m	Sou h West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	256m	North East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	270m	West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	314m	Sou h
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	319m	North
NUZ3	HILLS, RIDGES AND BUFFER AREAS		TP 2008	NI2008-27	31/03/2008	337m	Sou h West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	341m	North East
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	350m	Sou h East
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	350m	North West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	355m	West
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	359m	North East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	367m	North West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	372m	North East
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	400m	West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	407m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	408m	Sou h East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	419m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	419m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	423m	East
TSZ1	TRANSPORT		TP 2008	NI2008-27	31/03/2008	437m	North West
NUZ3	HILLS, RIDGES AND BUFFER AREAS		TP 2008	NI2008-27	31/03/2008	464m	North East
NUZ4	RIVER CORRIDOR		TP 2008	NI2008-27	31/03/2008	507m	Sou h
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	513m	Sou h East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	523m	North West
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	533m	Sou h East
CF	COMMUNITY FACILITIES		TP 2008	NI2008-27	31/03/2008	536m	East
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	540m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	556m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	591m	East
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	609m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	633m	North
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	642m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	644m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	655m	North East

Zone Code	Zone Name	Description	Variation	Gazettal Name	Gazettal Date	Distance	Direction
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	696m	East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	734m	Sou h East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	812m	North West
CZ4	LOCAL CENTRE		TP 2008	NI2008-27	31/03/2008	830m	North
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	831m	West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	835m	North West
RZ2	SUBURBAN CORE		TP 2008	NI2008-27	31/03/2008	837m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	854m	North
RZ1	SUBURBAN		TP 2008	NI2008-27	31/03/2008	857m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	916m	North West
NUZ3	HILLS, RIDGES AND BUFFER AREAS		TP 2008	NI2008-27	31/03/2008	937m	Sou h East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	947m	North East
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	950m	North West
NUZ4	RIVER CORRIDOR		TP 2008	NI2008-27	31/03/2008	974m	North West
PRZ1	URBAN OPEN SPACE		TP 2008	NI2008-27	31/03/2008	975m	East

Territory Plan Zones Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Territory Plan Overlays

Tharwa Drive, Gordon, ACT 2906



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Inter-town Public Transport
- Main Avenues & Approach Routes
- Future Urban Areas
- Special Requirements
- National Land
- Kingston Foreshore
- Public Land
- Wilderness Area
- National Park
- Nature Reserve
- Special Purpose Reserve
- Urban Open Space
- Cemetery or Burial Ground
- Protection of Water Supply
- Lake
- Sport and Recreation Reserve
- National Land Proposed for Urban Development

Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate	Coordinate System: GDA 1994 MGA Zone 55	Date: 24 September 2020

Planning

Tharwa Drive, Gordon, ACT 2906

Territory Plan Overlays (areas)

What Plan Overlays (areas) exist within the report buffer?

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
1024	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	Onsite
2558	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	North East
469	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	South
472	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	East
764	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	South
1003	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	North
1005	Pe	Urban Open Space.	TP 2008	NI2008-27	0m	North West
405	Pd	Special Purpose Reserve.	TP 2008	NI2008-27	150m	South West
1800	S	Special Requirements apply under N.C.P.	TP 2008	NI2008-27	150m	South
1022	Pe	Urban Open Space.	TP 2008	NI2008-27	169m	South West
471	Pe	Urban Open Space.	TP 2008	NI2008-27	234m	East
1023	Pe	Urban Open Space.	TP 2008	NI2008-27	256m	South West
763	Pe	Urban Open Space.	TP 2008	NI2008-27	314m	South
381	Pd	Special Purpose Reserve.	TP 2008	NI2008-27	337m	South West
1157	Pe	Urban Open Space.	TP 2008	NI2008-27	341m	North East
1599	Pe	Urban Open Space.	TP 2008	NI2008-27	408m	South East
2141	Pe	Urban Open Space.	TP 2008	NI2008-27	419m	North West
1144	Pe	Urban Open Space.	TP 2008	NI2008-27	423m	East
3717	Pc	Nature Reserve.	TA2017-17	NI2017-488	464m	North East
1699	Pe	Urban Open Space.	TP 2008	NI2008-27	513m	South East
1001	Pe	Urban Open Space.	TP 2008	NI2008-27	556m	North
1674	Pe	Urban Open Space.	TP 2008	NI2008-27	591m	East
1681	Pe	Urban Open Space.	TP 2008	NI2008-27	644m	North East
473	Pe	Urban Open Space.	TP 2008	NI2008-27	655m	North East
1146	Pe	Urban Open Space.	TP 2008	NI2008-27	696m	East
470	Pe	Urban Open Space.	TP 2008	NI2008-27	734m	South East
1720	Pe	Urban Open Space.	TP 2008	NI2008-27	831m	West
1004	Pe	Urban Open Space.	TP 2008	NI2008-27	835m	North West
1000	Pe	Urban Open Space.	TP 2008	NI2008-27	854m	North
3762	Pc	Nature Reserve.	TA2017-17	NI2017-488	937m	South East

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
1682	Pe	Urban Open Space.	TP 2008	NI2008-27	947m	North East
1002	Pe	Urban Open Space.	TP 2008	NI2008-27	950m	North West
379	Pd	Special Purpose Reserve.	TP 2008	NI2008-27	974m	North West
1145	Pe	Urban Open Space.	TP 2008	NI2008-27	975m	East

Territory Plan Overlays (lines)

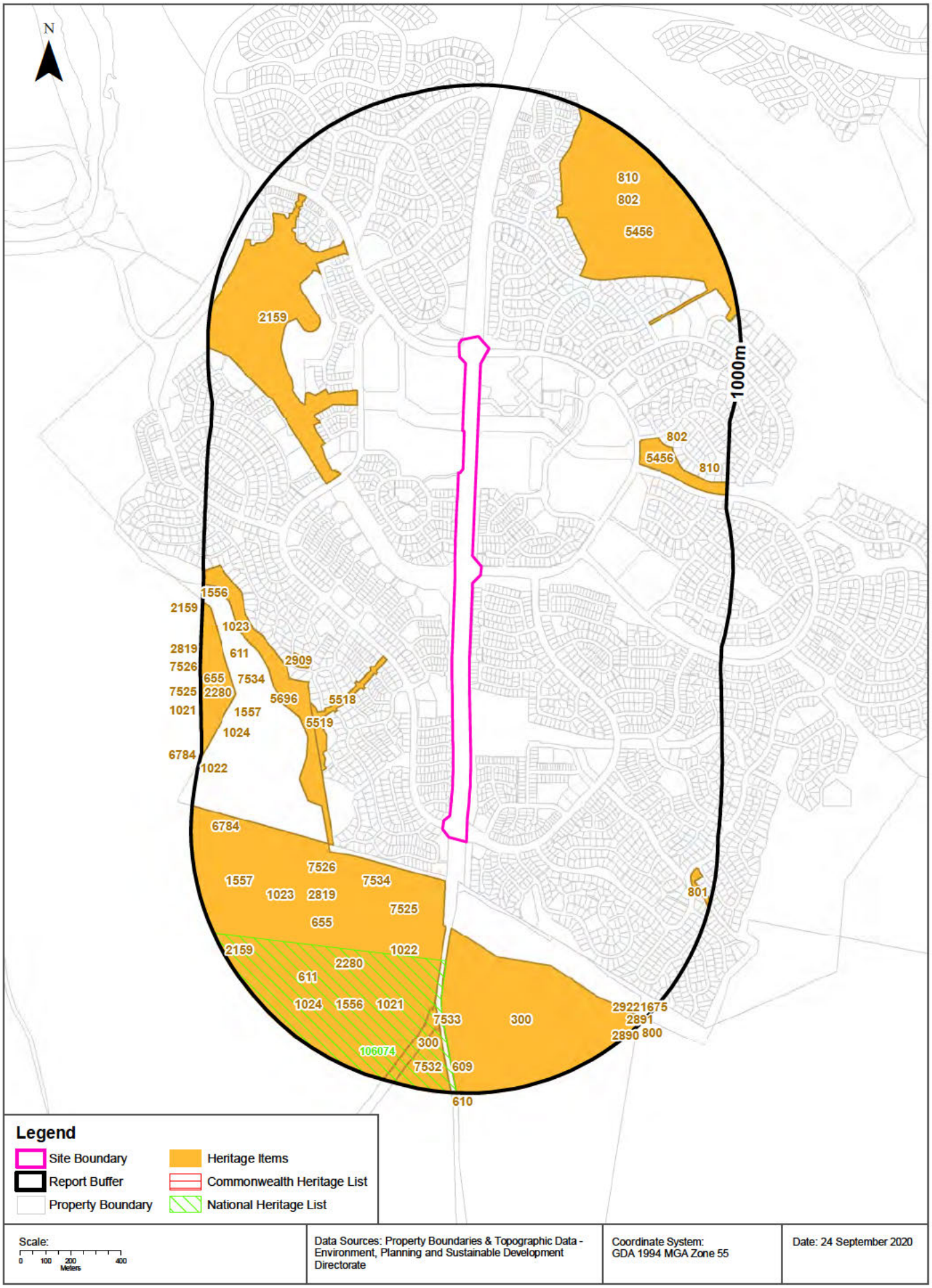
What Plan Overlays (lines) exist within the report buffer?

Id	Overlay Code	Overlay Name	Variation	Gazettal Name	Distance	Direction
3638	IPT	Inter-town Public Transport.	TA2017-03	NI2017-265	0m	North
140	PUBLAN	Public Land	TP 2008	NI2008-27	150m	South
41	PUBLAN	Public Land	TP 2008	NI2008-27	337m	West
3738	PUBLAN	Public Land	TA2017-17	NI2017-488	464m	North East

Territory Plan Overlay Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Heritage Items

Tharwa Drive, Gordon, ACT 2906



Heritage

Tharwa Drive, Gordon, ACT 2906

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
106074	Canberra and Surrounding Areas	Northbourne Av, Canberra ACT	8/01/000/0134	Historic	Nominated place		480m	South West

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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Heritage Sites

What Heritage SItes exist within the report buffer?

Map Id	Heritage Id	Name	Description	Status	Status Date	Location Type	Block Key	District	Division	Dist	Dir
1556	1162	CLSC17		Final Registration	09/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
2819	1162	CLSC18		Final Registration	09/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
1557	1162	CLSC20		Final Registration	09/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
6784	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
7525	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
7526	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
7534	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
611	2027	LHA 5		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
2280	2027	MRC52		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West

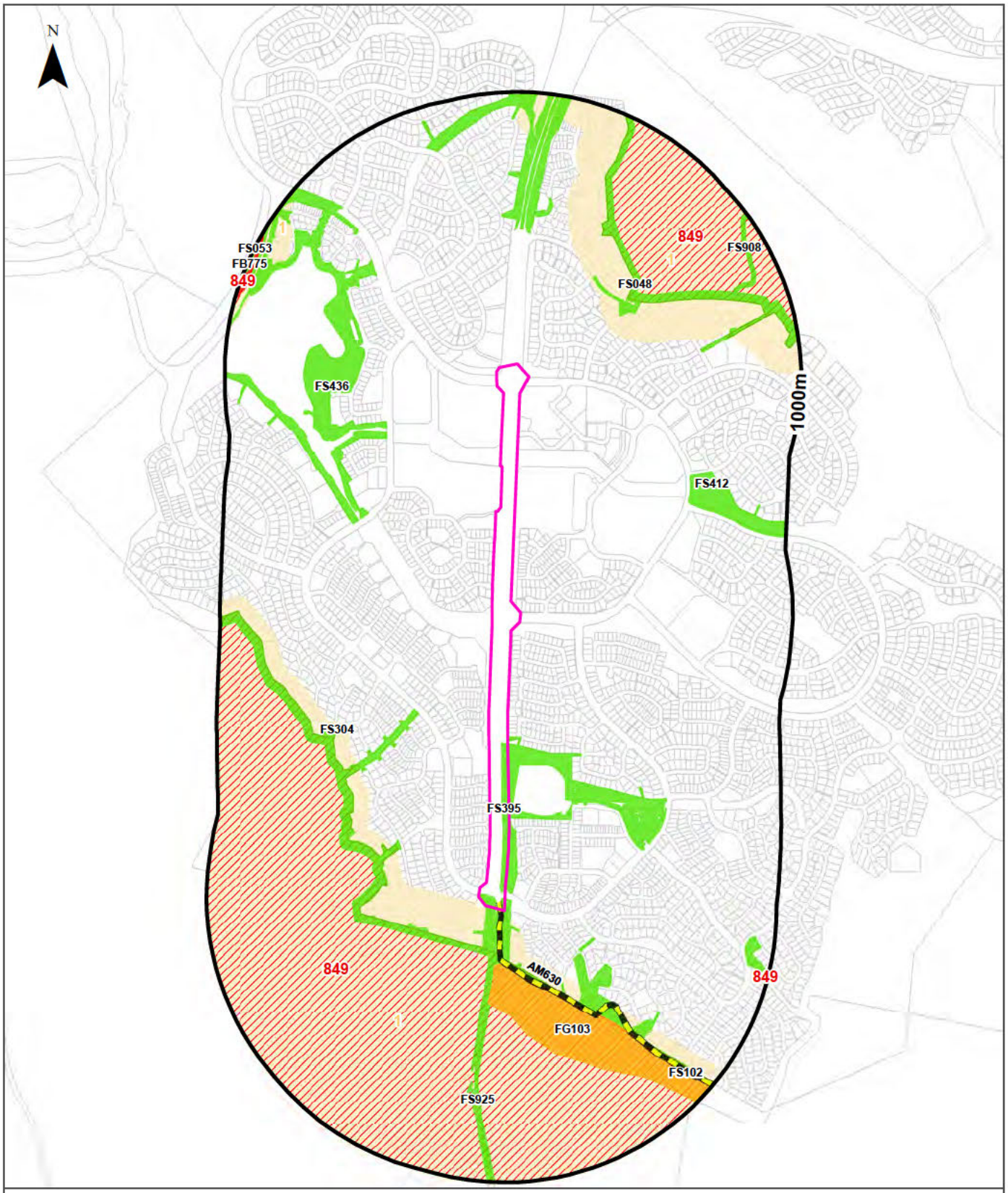
Map Id	Heritage Id	Name	Description	Status	Status Date	Location Type	Block Key	District	Division	Dist	Dir
655	2027	MRC54		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
1021	2029	MRC35		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
1022	2029	MRC36		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
1024	2029	MRC37a		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
1023	2029	MRC37b		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
2159	2029	MRC37c		Final Registration	08/03/2005	Restricted	60000001658	TUGGERANONG		170m	West
5518	2001	Gordon IF1		Final Registration	08/03/2005	Restricted	66165290001	TUGGERANONG	GORDON	256m	South West
5519	2001	Gordon IF2		Final Registration	08/03/2005	Restricted	66165290001	TUGGERANONG	GORDON	256m	South West
300	372	Lanyon	Blocks 128, 1244, 1245,1426, 1478, 1480,1481, 1537, 1494-1496	Final Registration		Historic		TUGGERANONG		345m	South
2159	2029	MRC37c		Final Registration	08/03/2005	Restricted	66165560005	TUGGERANONG	GORDON	419m	North West
5696	2001	Gordon IF3		Final Registration	08/03/2005	Restricted	66165710004	TUGGERANONG	GORDON	434m	West
5456	2029	CT-6		Final Registration	08/03/2005	Restricted	66131170015	TUGGERANONG	CONDER	464m	North East
810	2029	Tv 11		Final Registration	08/03/2005	Restricted	66131170015	TUGGERANONG	CONDER	464m	North East
802	2029	Tv 3		Final Registration	08/03/2005	Restricted	66131170015	TUGGERANONG	CONDER	464m	North East
2909	2027	Gordon 9 - 1		Final Registration	08/03/2005	Restricted	66165640008	TUGGERANONG	GORDON	562m	South West
2909	2027	Gordon 9 - 1		Final Registration	08/03/2005	Restricted	66165640007	TUGGERANONG	GORDON	564m	South West
2909	2027	Gordon 9 - 1		Final Registration	08/03/2005	Restricted	66165640006	TUGGERANONG	GORDON	595m	West
609	2027	LHA 3		Final Registration	08/03/2005	Restricted	60000001529			747m	South
609	2027	LHA 3		Final Registration	08/03/2005	Restricted	60000001665	TUGGERANONG		747m	South
610	2027	LHA 4		Final Registration	08/03/2005	Restricted	60000001529			747m	South
610	2027	LHA 4		Final Registration	08/03/2005	Restricted	60000001665	TUGGERANONG		747m	South
7532	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001529			747m	South
7532	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001665	TUGGERANONG		747m	South
7533	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001529			747m	South
7533	2027	Aboriginal Scarred Trees across he ACT		Final Registration	08/03/2005	Restricted	60000001665	TUGGERANONG		747m	South
801	2029	Tv 2		Final Registration	08/03/2005	Restricted	66140890015	TUGGERANONG	BANKS	903m	South East
800	2029	Tv 1		Final Registration	08/03/2005	Restricted	60000001546	TUGGERANONG		971m	South East
2890	1247	RRF14 and PAD		Final Registration	09/03/2005	Restricted	60000001546	TUGGERANONG		971m	South East
2891	1247	RRF15 and PAD		Final Registration	09/03/2005	Restricted	60000001546	TUGGERANONG		971m	South East

Map Id	Heritage Id	Name	Description	Status	Status Date	Location Type	Block Key	District	Division	Dist	Dir
2922	1247	RRF20 and PAD		Final Registration	09/03/2005	Restricted	60000001546	TUGGERANONG		971m	South East
1675	1247	RRF7 and PAD		Final Registration	09/03/2005	Restricted	60000001546	TUGGERANONG		971m	South East

Heritage Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Natural Hazards - Bushfire & Flood

Tharwa Drive, Gordon, ACT 2906



Legend

- Site Boundary
- Report Buffer
- Property Boundaries
- Bushfire Prone Area
- Bushfire Abatement Zone
- Flood 1% AEP

Access Management

- Construction
- Maintenance
- Upgrade
- Vegetation Management

Fuel Management

- Chemical
- Cultural Burn
- Ecological Burn
- Grazing
- Physical Removal
- Prescribed Burn
- Prescribed Burn (RFS)
- Slashing

Scale: 0 100 200 400 Meters

Data Sources: Property Boundaries & Topographic Data - Environment, Planning and Sustainable Development Directorate

Coordinate System: GDA 1994 MGA Zone 55

Date: 24 September 2020

Natural Hazards

Tharwa Drive, Gordon, ACT 2906

Bushfire Prone Areas

What Bushfire Prone Areas exist within the report buffer?

Feature Id	Description	Distance	Direction
1	Bushfire Prone Areas ACT	1m	South West

Bushfire Prone Area Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Abatement Zones

What Bushfire Abatement Zones exist within the report buffer?

Feature Id	Feature	Distance	Direction
849	Bushfire Abatement Zone	150m	North West

Bushfire Abatement Zone Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Operational Plan - Access Management

What Bushfire Operational Plan - Access Management exist within the report buffer?

Map Id	Treatment	Distance	Direction
AM630	Maintenance	0m	South

Bushfire Operational Plan Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Bushfire Operational Plan - Fuel Management

What Bushfire Operational Plan - Fuel Management exist within the report buffer?

Unique Id	Treatment	Hectares	Distance	Direction
FS395	Slashing	16.26	0m	Onsite
FS436	Slashing	38.77	0m	Onsite
FG103	Grazing	13.55	188m	South
FS304	Slashing	7.15	337m	West
FS412	Slashing	12.15	405m	North East
FS048	Slashing	27.05	465m	North East

Unique Id	Treatment	Hectares	Distance	Direction
FS925	Slashing	10.09	665m	South
FS102	Slashing	4.78	695m	South East
FS908	Slashing	4.69	819m	North East
FB775	Prescribed Burn (PCS)	18.85	962m	North West
FS053	Slashing	9.70	985m	North West

Bushfire Operational Plan Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Flood (1 Percent Annual Exceedance Probability)

What Flood zone (1% AEP) exists within the report buffer?

Feature Id	Description	Distance	Direction
N/A	No records within buffer		

Flood Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Vegetation Communities

Tharwa Drive, Gordon, ACT 2906

Ecological Constraints

Tharwa Drive, Gordon, ACT 2906

Vegetation Communities

What Vegetation Communities exist within the report buffer?

UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
URB	Urban and developed areas_URB			7.98	17.74	0m	Onsite
EXG	Exotic grassland_EXG			7.24	0.39	0m	Onsite
UOS	Urban Open Space_UOS			8.37	33.09	0m	Onsite
EPN	Environmental planting native_EPN			7.20	20.52	0m	Onsite
EPN	Environmental planting native_EPN			8.85	35.69	0m	South
UOS	Urban Open Space_UOS			8.25	21.07	0m	South
UOS	Urban Open Space_UOS			7.19	19.37	0m	North East
UOS	Urban Open Space_UOS			6.43	10.62	0m	North
UOS	Urban Open Space_UOS			7.52	38.21	0m	East
UOS	Urban Open Space_UOS			8.76	40.89	0m	North West
UOS	Urban Open Space_UOS			6.48	24.56	169m	South West
UOS	Urban Open Space_UOS			7.62	32.64	234m	East
EXF	Exotic forest_EXF			7.07	41.82	251m	South
APN	Amenity planting native_APN			7.45	44.36	254m	South West
NG	Native grassland_NG			0.00	0.00	265m	South
EPN	Environmental planting native_EPN			7.44	21.80	280m	South
EXG	Exotic grassland_EXG			3.98	1.65	312m	South
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	8.72	12.28	312m	South
u19	Blakely s Red Gum Yellow Box tall grassy woodland_u19	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	11.08	13.47	314m	South
NG	Native grassland_NG			3.81	0.30	322m	South
NG	Native grassland_NG			7.59	0.85	322m	South West
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.34	49.47	325m	South
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.67	16.16	325m	South West
u19	Blakely s Red Gum Yellow Box tall grassy woodland_u19	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	8.62	22.81	326m	South
UOS	Urban Open Space_UOS			8.29	32.60	341m	North East
NG	Native grassland_NG			4.19	0.26	346m	South
EXG	Exotic grassland_EXG			4.43	1.18	382m	South
UOS	Urban Open Space_UOS			9.82	34.22	410m	South
EPN	Environmental planting native_EPN			7.55	48.24	412m	South

UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
UOS	Urban Open Space_UOS			7.87	19.14	419m	North West
UOS	Urban Open Space_UOS			7.12	12.71	423m	East
UOS	Urban Open Space_UOS			4.58	12.59	431m	South West
NG	Native grassland_NG			3.74	0.48	468m	North
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	8.64	23.77	491m	North East
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	9.15	14.79	512m	South
UOS	Urban Open Space_UOS			9.67	38.27	513m	South East
EPN	Environmental planting native_EPN			5.38	12.13	530m	North
NG	Native grassland_NG			3.50	0.05	544m	North
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	8.19	22.64	556m	North
UOS	Urban Open Space_UOS			8.04	17.70	556m	North
Water	Water			6.41	1.27	560m	North West
NG	Native grassland_NG			4.63	0.29	570m	South
u66	Mealy Bundy Red Stringybark grass-forb mid-high open forest_u66	DRY SCLEROPHYLL FORESTS	Upper Riverina Dry Sclerophyll Forests	5.91	17.77	580m	North
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.38	15.06	585m	South West
UOS	Urban Open Space_UOS			8.47	21.72	591m	East
UOS	Urban Open Space_UOS			8.90	39.70	596m	South East
NG	Native grassland_NG			8.41	0.71	617m	North East
q1	Drooping She-oak low woodland to open forest on shallow infertile hillslopes in the Australian Capital Territory and surrounds_q1	DRY SCLEROPHYLL FORESTS	Southern Tableland Dry Sclerophyll Forests	5.08	31.05	633m	North East
UOS	Urban Open Space_UOS			9.87	7.26	644m	North East
APN	Amenity planting native_APN			4.88	6.45	646m	South West
UOS	Urban Open Space_UOS			10.34	33.63	649m	South
UOS	Urban Open Space_UOS			6.08	36.46	655m	North East
UOS	Urban Open Space_UOS			5.21	15.63	662m	North West
APN	Amenity planting native_APN			4.71	10.14	662m	North
NG	Native grassland_NG			5.43	0.31	668m	North
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	6.02	22.09	670m	South West
u66	Mealy Bundy Red Stringybark grass-forb mid-high open forest_u66	DRY SCLEROPHYLL FORESTS	Upper Riverina Dry Sclerophyll Forests	4.59	11.97	675m	North
UOS	Urban Open Space_UOS			6.74	14.25	696m	East
UOS	Urban Open Space_UOS			8.60	37.40	724m	North West
NG	Native grassland_NG			5.19	0.42	728m	North
NG	Native grassland_NG			7.55	1.10	728m	North East
EPN	Environmental planting native_EPN			5.77	13.09	731m	North

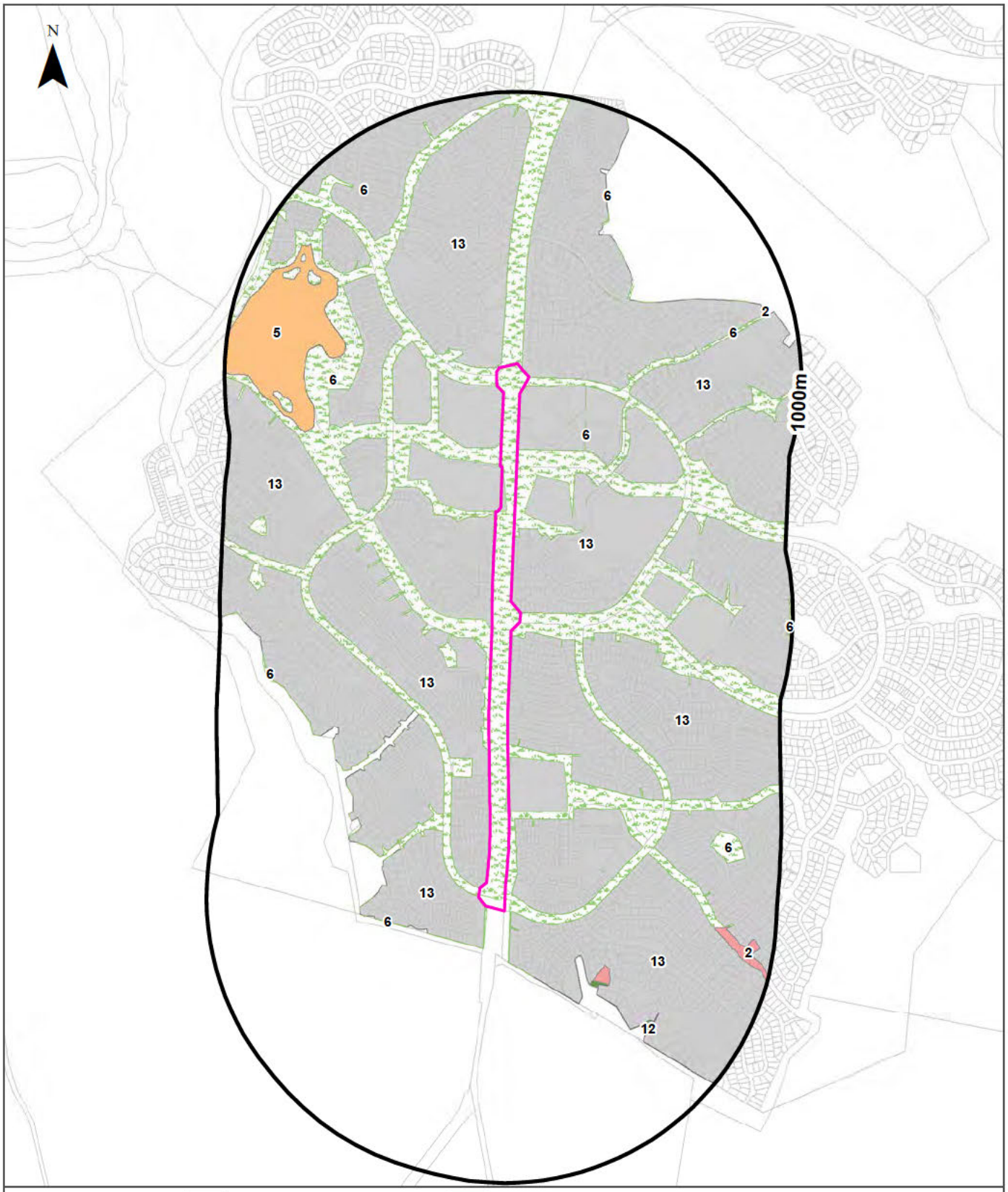
UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
UOS	Urban Open Space_UOS			12.67	60.30	734m	South East
EXG	Exotic grassland_EXG			7.66	5.80	736m	North East
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.24	17.32	746m	South
u66	Mealy Bundy Red Stringybark grass-forb mid-high open forest_u66	DRY SCLEROPHYLL FORESTS	Upper Riverina Dry Sclerophyll Forests	6.98	33.54	749m	North East
UOS	Urban Open Space_UOS			9.37	42.58	751m	North West
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.61	18.85	757m	North
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.61	17.68	757m	South West
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.98	17.88	774m	North
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.59	15.67	787m	South West
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.62	16.92	789m	South West
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	6.64	26.06	793m	North East
EPN	Environmental planting native_EPN			5.03	8.06	798m	South
u19	Blakely s Red Gum Yellow Box tall grassy woodland_u19	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.09	13.63	811m	South
UOS	Urban Open Space_UOS			5.13	46.11	812m	North West
UOS	Urban Open Space_UOS			5.30	24.23	812m	North West
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.65	28.09	828m	South West
UOS	Urban Open Space_UOS			7.47	13.98	831m	West
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	10.87	14.45	832m	West
UOS	Urban Open Space_UOS			7.21	25.16	835m	North West
EXS	Exotic shrubland_EXS			5.17	3.49	842m	South West
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.57	22.32	843m	North
UOS	Urban Open Space_UOS			9.22	32.60	854m	North
u66	Mealy Bundy Red Stringybark grass-forb mid-high open forest_u66	DRY SCLEROPHYLL FORESTS	Upper Riverina Dry Sclerophyll Forests	5.44	23.91	860m	North East
u19	Blakely s Red Gum Yellow Box tall grassy woodland_u19	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	9.04	19.66	863m	West
EXG	Exotic grassland_EXG			7.27	0.35	873m	West
EPN	Environmental planting native_EPN			5.84	11.35	919m	South East
u66	Mealy Bundy Red Stringybark grass-forb mid-high open forest_u66	DRY SCLEROPHYLL FORESTS	Upper Riverina Dry Sclerophyll Forests	8.27	18.42	939m	South West
u178	Yellow Box ± Apple Box tall grassy woodland_u178	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	9.20	36.39	943m	North East
u29	Apple Box Broad-leaved Peppermint tall shrub-grass open forest primarily on granitoids_u29	DRY SCLEROPHYLL FORESTS	Southern Tableland Dry Sclerophyll Forests	6.27	6.12	947m	North
NG	Native grassland_NG			5.08	0.21	948m	North
UOS	Urban Open Space_UOS			6.91	38.88	950m	North West

UMC Id	Community	Formation	"Keith" Vegetation Class	Mean Height	Canopy Cover	Distance	Direction
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.80	8.81	960m	West
EXG	Exotic grassland_EXG			5.32	0.45	961m	North West
EXG	Exotic grassland_EXG			5.39	0.01	968m	North West
UOS	Urban Open Space_UOS			9.54	25.79	975m	East
u29	Apple Box Broad-leaved Peppermint tall shrub-grass open forest primarily on granitoids_u29	DRY SCLEROPHYLL FORESTS	Southern Tableland Dry Sclerophyll Forests	5.04	12.59	977m	North East
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	7.65	27.56	984m	North East
q6	Red Box tall grass-shrub woodlands primarily on hillslopes and footslopes in the Australian Capital Territory_q6	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	9.26	12.50	985m	South West
APN	Amenity planting native_APN			6.74	12.90	986m	North West
u19	Blakely s Red Gum Yellow Box tall grassy woodland_u19	GRASSY WOODLANDS	Southern Tableland Grassy Woodlands	9.91	10.00	988m	South West

Vegetation Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Vegetation Subformation

Tharwa Drive, Gordon, ACT 2906



Ecological Constraints

Tharwa Drive, Gordon, ACT 2906

Vegetation Subformation

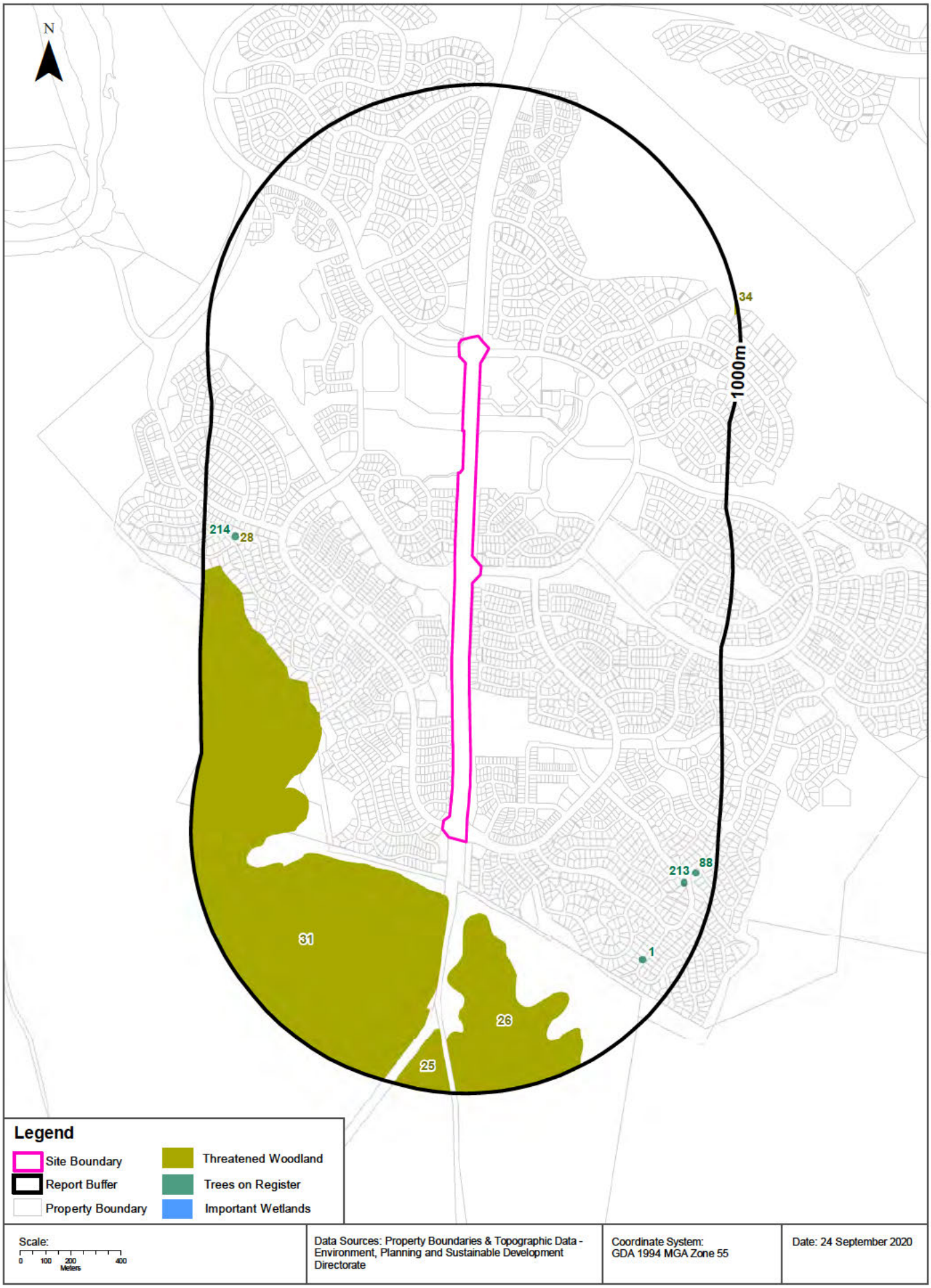
What Vegetation Subformations exist within the report buffer?

Object Id	Subformation	Distance	Direction
6	Modified grassland / Urban vegetation complex	0m	Onsite
13	Urban	0m	Onsite
12	Woodland	262m	North West
2	Dry Forest	314m	North
5	Lakes / Water	561m	North

Vegetation Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints - Threatened Woodland, Wetlands &Tree Register

Tharwa Drive, Gordon, ACT 2906



Ecological Constraints

Tharwa Drive, Gordon, ACT 2906

Threatened Woodland

What ACT Listed Threatened Woodland exists within the report buffer?

Feature Id	Community	EPBCStatus	ACT Status	Distance	Direction
31	Yellow Box Red Gum Grassy Woodland	Not listed	Endangered Ecological Community	214m	South West
26	Yellow Box Red Gum Grassy Woodland	Not listed	Endangered Ecological Community	283m	South
25	Yellow Box Red Gum Grassy Woodland	Not listed	Endangered Ecological Community	747m	South
28	Yellow Box Red Gum Grassy Woodland	Not listed	Endangered Ecological Community	857m	West
34	Yellow Box Red Gum Grassy Woodland	Not listed	Endangered Ecological Community	985m	North East

Threatened Woodland Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Tree Register

What Trees on the ACT register exists within the report buffer?

Feature Id	Genus	Species	Tree Ref	Tree Height	Status	Date Edit	Distance	Direction
1	Eucalyptus	melliodora	PTR082	14.0	REGISTERED		829m	South East
214	Eucalyptus	melliodora	PTR197	15.0	REGISTERED	15/03/2016	856m	West
213	Eucalyptus	blakelyi	PTR196	19.0	REGISTERED	06/01/2019	866m	South East
88	Eucalyptus	melliodora	PTR044	22.0	REGISTERED		905m	South East

Tree Register Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Important Wetlands

What Wetlands exist within the report buffer?

Feature Id	Name	Distance	Direction
N/A	No records within buffer		

Important Wetlands Data Source: ACT Government Creative Commons 4.0 © https://creativecommons.org/licenses/by/4.0/

Ecological Constraints

Tharwa Drive, Gordon, ACT 2906

Groundwater Dependent Ecosystems Atlas

GDEs within the dataset buffer:

Type	Name	GDE Potential	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
No records within buffer								

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology
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Ecological Constraints

Tharwa Drive, Gordon, ACT 2906

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status
N/A	No records in buffer					

Data does not include NSW category 1 sensitive species.
NSW BioNet: © State of NSW and Office of Environment and Heritage

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise match	Georeferenced to the site location / premise or part of site
General area or suburb match	Georeferenced with the confidence of the general/approximate area
Road match	Georeferenced to the road or rail
Road intersection	Georeferenced to the road intersection
Feature is a buffered point	Feature is a buffered point
Land adjacent to geocoded site	Land adjacent to Georeferenced Site
Network of features	Georeferenced to a network of features

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Appendix D

ACT EPA Contaminated Land Search

From: Zhang, Jianmin <Jianmin.Zhang@act.gov.au> on behalf of Contaminated Sites <ContaminatedSites@act.gov.au>
Sent: Wednesday, 7 October 2020 10:14 AM
To: [redacted]
Subject: Contaminated Land Search Result - Block 13 Section 211 Conder Tuggeranong

OFFICIAL

Dear [redacted]

RE: CONTAMINATED LAND SEARCH

Thank you for your search form request of 24/09/2020 enquiring about:

Block 13 Section 211 Conder Tuggeranong

Records held by the Environment Protection Authority (EPA) for the above block(s) indicate the following:

The section of Tharwa Drive between Woodcock Drive and Pockett Avenue is not recorded on the EPA's contaminated sites management database or geographic information system.

Whilst there is no recorded information on potential site contamination, roads have been associated with potential site contamination due to the placement of uncontrolled fill during the establishment of the road.

The ACT EPA Contaminated Sites Environment Protection Policy 2017 lists landfilling as activities associated with land contamination which may pose a risk to human health and the environment.

EPA records also indicate that there is an operational service station located at the adjacent block, Block 1 Section 226 Conder.

Under the precautionary principal, all blocks adjacent to sites which contain service stations are identified and persons making enquiries are made aware of potential for impacts from adjacent sites due to the ability of hydrocarbons and other contaminants to migrate through the environment.

There is no information recorded by the EPA that the service station on the adjacent block has adversely impacted Tharwa Drive.

The EPA has not issued any orders of assessment or remediation under sections 91C (1) or 91D (1) respectively, environment protection orders under sections 125 (2) or (3), requested an audit under section 76 (2) or received an audit notification under section 76A (1) of the *Environment Protection Act 1997* (the Act) over the site and as a result the site is not recorded on the Register of contaminated sites under section 21A of the Act.

The information detailed above only relates to records held by the EPA and may not represent the actual condition of the site.

At present the EPA has no information on contamination of the above block(s) other than as detailed above. However, this does not absolutely rule out the possibility of contamination and should not be interpreted as a warranty that there is no contamination.

I appreciate that this does not absolutely rule out the existence of contamination of the soils. If you or your clients wish to be completely sure you, or they, should arrange to conduct independent tests.

Regards
Jianmin

Jianmin Zhang | Environment Protection Officer, Environmental Quality
Office of the Environment Protection Authority

Access Canberra | Chief Minister Treasury and Economic Development Directorate | ACT
Phone: 02 6207 2157|Email: jianmin.zhang@act.gov.au
480 Northbourne Avenue, Dickson | GPO Box 158 Canberra ACT 2601 | www.act.gov.au/accessCBR

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Appendix E Tree Assessment

Tree Assessment Report

Tharwa Drive Duplication
Gordon, Condor and Banks, ACT

ISSUE 1_ 18 November 2020

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Prepared by
Enviro Links Design Pty Ltd (2020)

For
Calibre

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2.2 Quality Ranking 4

2.3 Limitations 5

3 Tree Assessment Summary 5

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1 Introduction

Enviro Links Design Pty Ltd was engaged by the ACT Government care of Calibre, to undertake the tree assessment for the Tharwa Drive Duplication site, Gordon, Condor and Banks ACT. The report highlights the value of individual trees and groups to assist with the transport corridor planning and design.

Figure 1: Extent of Tree Assessment

2 Methodology

The following describes in general terms the processes and criteria that trees and tree groups were assessed.

Tree Number/Group: A unique reference number is assigned to each tree or group of trees. Each tree/group of trees is numbered and referenced in the Plan and Report as applicable.

2.1 Tree Data

Species

- Botanical Name

Height, Canopy and Trunk Circumference (Physical Dimensions)

- Height in metres
- Canopy diameter in metres shown as the maximum crown width of the tree or group of trees
- For Single Trunks circumference in metres, measured 1 metre above ground level
- For multiple trunks the cumulative total of each trunk in metres at 1 metre above ground level

Number of Trunks

- Number of trunks at 1 metre above ground level

Health and vigour

- The general health and vigour Tree

Structural defects and decay

- Structural defects or evidence of internal decay

Past Damage or root disturbance

- Evidence of past damage to the tree or disturbance within the root zone

Disease or infestation

- Evidence of past or present disease or insect infestation

Stage

- Current growth stage (e.g. juvenile, semi-mature, mature or over mature)

Quality Ranking

- Tree quality classification trees are to be classified as being of:
  Exceptional (E), High (H), Medium (M), or Low (L) quality. Refer to notes below

Notes

- Habitat – nests, birds, other wildlife
- General comments and notes

2.2 Quality Ranking

E - Exceptional Value
Trees that are outstanding examples of their species and have significant visual impact. They have most of the following: mature specimens with grand appearance and stature; may have unusual character; may be a rare species; well balanced; cultural heritage importance; significant scientific value; presents a low hazard/safety risk. Significant value within the landscape context of the site and should be preserved.

H - High Value
Trees that are good examples of their species and have significant visual impact. They have most of the following: high arboricultural value or potential; good form; healthy specimens with good size and little or no epicormic shoots or other arboricultural problems. Good value within the landscape context of the site and should be preserved if at all possible.

M - Medium Value
Trees generally complying with most of the following: reasonable form or reasonable current size with good health / growth potential; healthy specimen with significant growth (or with moderate tree surgery a large tree can be modified from fair to good health, ie can carry some deadwood); has value within the landscape context of the site; presents a medium to low hazard/safety risk. Does not justify special attention of construction expenditure but justifies a minor design adjustment to save or could be removed if necessary. Retain if appropriate to land use and future management cost and risks.

P - Poor Value
Trees generally complying with most of the following: specimen with low growth or poor form and possible health problems; trees of little value; presents a high or very high hazard/safety risk. Expendable, remove if necessary - retain if appropriate to land use and future management costs and risks.

D - Dead Tree

2.3 Limitations

The tree assessment was undertaken by non-invasive visual review means only. No coring, probing, excavation, dissection or laboratory analysis was undertaken. Assessments were made on visual and physical (external and above ground measurement) only.

Trees Stage assessments of "over mature" were based on visual inspection and characteristics. Trees in an overmature and/or senescent state can often survive without adverse impacts for 0 -20 years (and even say a decade longer on occasions) without noticeable change in external appearance. If to be retained in high activity zones (eg residential blocks, verges, high use park activity areas) it is recommended further Arboricultural investigation which may include climbing the tree and inspecting hollows; resistograph testing; etc is undertaken to better determine safe useful life expectancy (SULE) and tree management requirements. This can support a tree removal request or allow some surety that no present risk which may allow works closer to the tree – but as always best (both in terms of tree impacts or approvals success need) if no works within the Tree Protection Zone (TPZ). Alternatively under the Tree Management Plan prepared by the design team propose removal of selected trees and await agency decision if they accept.

3 Tree Assessment Summary

The tree assessment was undertaken on the 11th of November 2020. A total of 11 individual trees and 37 Groups were assessed.

The trees are predominantly Cassuarina cunnninghamiana and mixed Eucalyptus species plantings as linear tree groups, following the orientation of the existing road. There are a number of exotic trees (Populus alba and Polupus deltoides). Eucalyptus species identified on the site are Eucalyptus mannifera, Eucalyptus melliodora, Eucalyptus sideroxylon, Eucalyptus polyanthemos, Eucalyptus bridgesiana, Eucalyptus nicholii, Eucalyptus nortonii, Eucalyptus viminalis and Eucalyptus cinerea.

The assessment identified;

- 30 medium quality tree groups
- 6 medium quality individual trees
- 8 poor quality tree groups; and
- 5 poor quality individual tree.

The 30 medium quality tree groups are predominantly planted of either Casuarina cunninghamiana or mixed Eucalyptus. These make up the majority of trees within the assessment area and provide a good visual buffer to the adjoining residence. They also create a strong landscape character that focuses the view along the road. In addition they provide shade to the pedestrian paths.

The following images are representative of the typical tree and vegetation character of the road corridor and medium quality tree groups.

Figure 2: Tree group 15

Figure 3: Tree group 27

Figure 4: Tree Group 11

Figure 5: Tree Groups 35 (Left of path) and 34 (right of path)

The following image is of tree 751, a Eucalyptus nortonii which is an interesting specimen for the street (no other E. nortonii in the area) and was observed to have numerous birds utilising the canopy at the time of the inspection.

Figure 6: Tree 751

4 Appendix 1 – Tree Location Plan and Tree Assessment Table

THARWA DRIVE DUPLICATION

BANK, CONDER AND GORDON, ACT

TREE ASSESSMENT

PREPARED FOR: calibre

DRAWING LIST

DWG NO.	DRAWING TITLE	REVISION
TA00	TREE ASSESSMENT COVER PAGE	A
TA01	TREE ASSESSMENT PLAN SHEET 1	A
TA02	TREE ASSESSMENT PLAN SHEET 2	A
TA03	TREE ASSESSMENT PLAN SHEET 3	A
TA04	TREE ASSESSMENT PLAN SHEET 4	A
TA05	TREE ASSESSMENT PLAN SHEET 5	A

PLEASE NOTE TREE LOCATIONS & NUMBERS WERE LOCATED BY SURVEYOR ON PLAN AND WERE VERIFIED FROM SITE INSPECTION UNDERTAKEN BY ENVIRO LINKS DESIGN PTY LTD. NOVEMBER 2020. TREE GROUP NUMBERS AND TREE/GROUP VALUES ALLOCATED BY ENVIRO LINKS DESIGN.

E,H,M,P,D

VALUE RANKING : INDIVIDUAL TREES
The delineation within the value classification is based on the works being on leased land and therefore under the jurisdiction of the TCCS Urban TreeScapes Unit (UTU) All trees on Government Land are regarded as protected trees and can not be removed or damaged or works undertaken near them without the approval of the UTU. (The Tree Act. and Regulated Tree definitions are therefore applicable to leased site, unless otherwise advised).

E

EXCEPTIONAL VALUE - trees that are outstanding examples of their species and have significant visual impact. They have most of the following: mature specimens with grand appearance and stature; may have unusual character; may be a rare species; well balanced; cultural heritage importance; significant scientific value; presents a low hazard/safety risk. Significant value within the landscape context of the site and should be preserved.

H

HIGH VALUE - trees that are good examples of their species and have significant visual impact. They have most of the following: high arboricultural value or potential; good form; healthy specimens with good size and little or no epicormic shoots or other arboricultural problems. Good value within the landscape context of the site and should be preserved if at all possible.

M

MEDIUM VALUE - trees generally complying with most of the following: reasonable form or reasonable current size with good health / growth potential; healthy specimen with significant growth (or with moderate tree surgery a large tree can be modified from fair to good health, ie can carry some deadwood); has value within the landscape context of the site; presents a medium to low hazard/safety risk. Does not justify special attention of construction expenditure but justifies a minor design adjustment to save or could be removed if necessary. Retain if appropriate to land use and future management cost and risks.

P

POOR VALUE - trees generally complying with most of the following: specimen with low growth or poor form and possible health problems; trees of little value; presents a high or very high hazard/safety risk. . Expendable, remove if necessary - retain if appropriate to land use and future management costs and risks.

NOTE: ALL TREES ON ACT GOVERNMENT PUBLIC LAND FALL UNDER PROTECTED STATUS.

TREE ASSESSMENT ELEMENTS

Number: Unique and sequential identification number
Name: Botanical name
Height: (m)
Trunk: Diameter (m) at 1 metre above natural ground level
Canopy: Diameter (m) at the furthest point from the trunk (m)
Health: The general health and vigour Tree
Defects / Decay: Structural defects or evidence of internal decay
Damage / Disturbance: Evidence of past damage to the tree or disturbance within the root zone
Disease: Evidence of past or present disease or insect infestation;
Stage: Current growth stage (e.g. juvenile, semi-mature, mature or over mature).
Quality: Tree quality classification trees are to be classified as being of Exceptional (E), High (H), Medium (M), Poor (P), or Low (L) quality.
Tree Act Status: Refer notes below

NOTE: TREE MEASUREMENTS WERE COLLECTED FROM THE SURVEYORS PROVIDED DIMENSIONS.

Tree 'Regulated' Status by Virtue of Size (On - Lease)
Under the Tree Protection Act 2005 a tree is termed a Regulated Tree and is to be protected if it is growing on Urban Leased land and has at least one of:
* A height of 12m or more; or
* A trunk circumference of 1.5m (approx 0.5m in diameter) or more at 1m above ground level; or
* Two or more trunks and the total circumference of all the trunks, 1m above ground level, is 1.5m or more, or
* A minimum crown width of 12m or more, and
* Must be alive - all dead trees have been ranked as Non Protected tree.
* Is not a weed species under the Pest Plant & Animals Declaration 2005

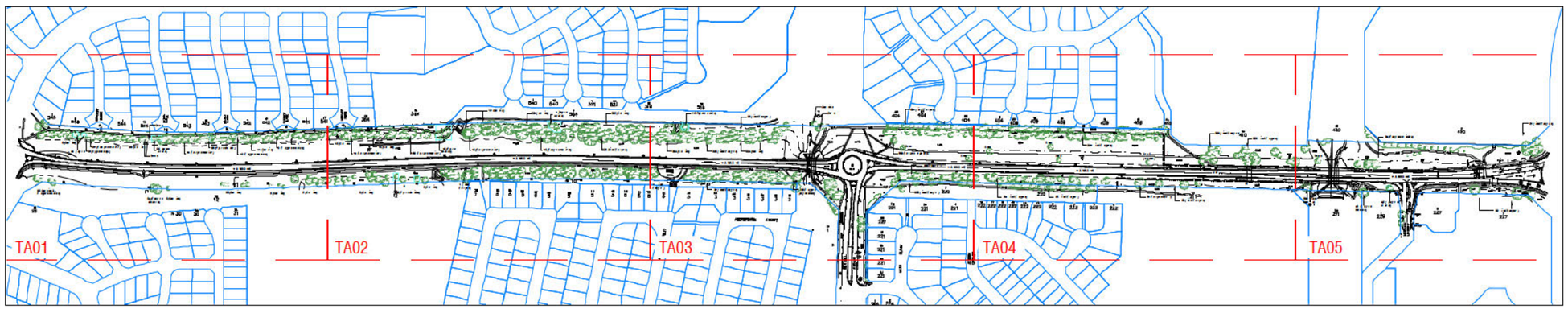
Tree Protected Status
YES - The tree has a dimension that any activity must be assessed under the Tree Protection Act on Leased land; or is on Government land eg. road verge, park, etc as all trees on Government land are protected.
NO - The tree if on Leased land is sufficiently small or declared a Weed Species that it does not require assessment under the Tree Protection Act.
NA - Not applicable as Off Lease but often protected as these trees are generally on Government (Unleased) land.

Trees nominated as Protected can only be removed / pruned if approval in writing gained from all applicable Government agencies.

Future Tree Approvals
On-Leased land: if a tree has protected status then approval must be gained from TCCS Urban TreeScapes Unit prior to removal, lopping or ground damaging activty.

Off-Leased (Territory) land: Please note all trees located external to the leased block boundary i.e. the verge or open space, cannot be removed, pruned or damaged without the approval of the Urban TreeScapes Unit, City Services (13 22 81) as on Government land.

Tree Management:
Trees within lease require a Tree Management Plan (TMP) and on the verge a Landscape Management Protection Plan (LMPP) outlining removals, pruning, tree protection measures, site access and restorative works issues as part of the design process.



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PROJECT TEAM: calibre

CLIENT: ACT Government

LANDSCAPE ARCHITECT: enviro links design
5 / 61 Dundas Court PHILLIP ACT 2606
Ph:(02) 6281 6066 www.enviroinks.com.au

PROJECT: THARWA DRIVE DUPLICATION

TITLE: TREE ASSESSMENT COVER SHEET
SCALE: NTS@A3
ISSUE: A
JOB NO.: 2042
DWG NO.: TA00

COVENTRY CLOSE
REVELL CLOSE
O'HARA CLOSE
MINNETT CLOSE
THARWA DRIVE
JOINS TA02
JOINS TA02

G6 *(Casuarina)*
2 No. Dead *(Populus deltoides)*
G7 *(Cuppressus sp.)*
137 *(Eucalyptus mannifera)*
G8 *(Casuarina)*
Shrubs
G9 *(Populus deltoides)*
Shrubs
G10 *(Eucalyptus mannifera)*
296 *(Populus deltoides)*
G12 *(Eucalyptus mannifera)*
G11 *(Casuarina)*
9 *(Eucalyptus mannifera)*
G13 *(Casuarina)*
G5 *(Casuarina & Eucalyptus mannifera)*
G4 *(Eucalyptus sideroxylon)*
G3 *(Casuarina)*
G3 *(Casuarina)*
G3 *(Casuarina)*
G3 *(Casuarina)*

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PROJECT TEAM
calibre

CLIENT
ACT Government

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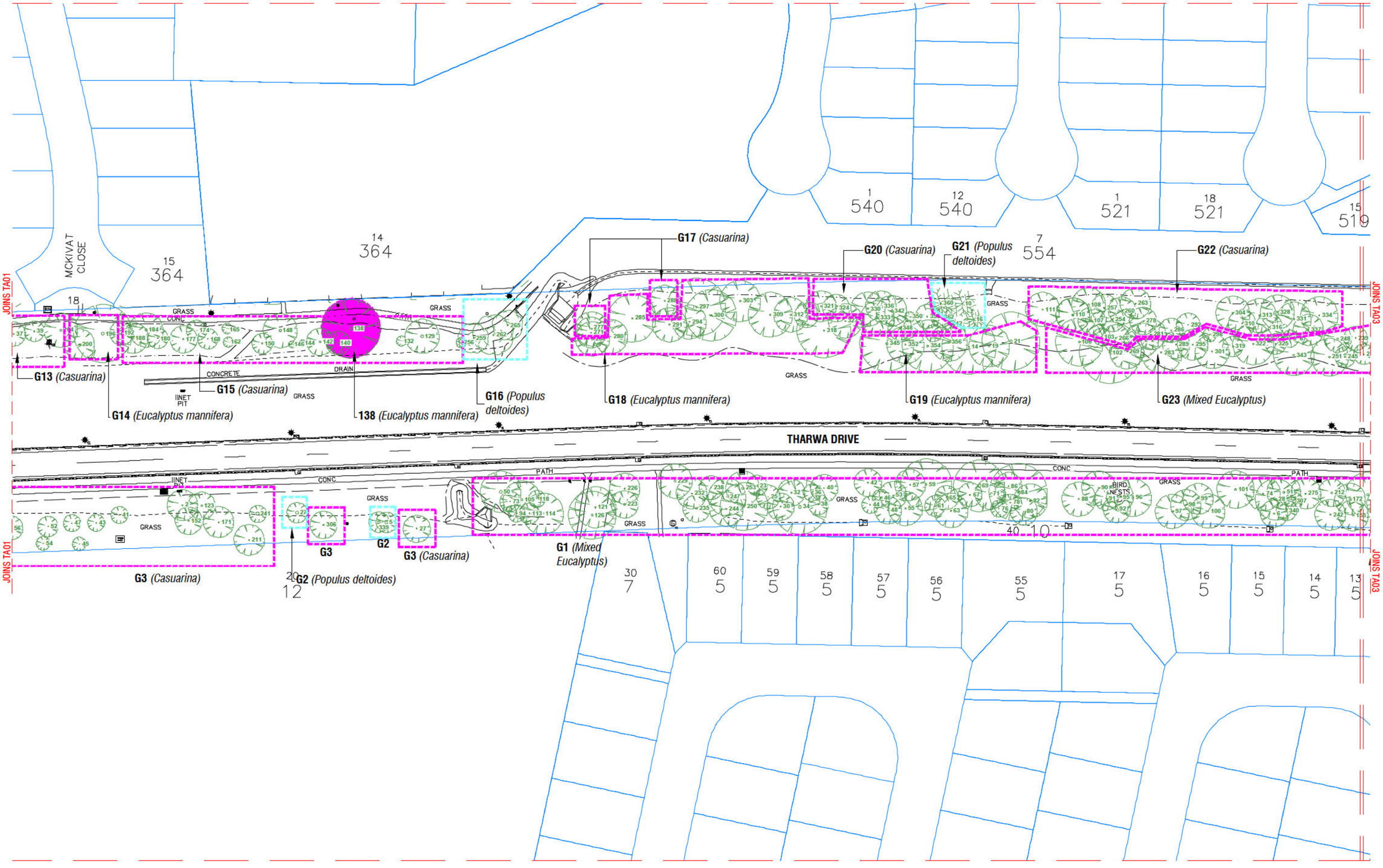
PROJECT
THARWA DRIVE DUPLICATION

TITLE
TREE ASSESSMENT PLAN 1

SCALE 1:1000@A3 (0 10 20 30 40m)
ISSUE A
JOB NO. 2042
DWG NO. TA01



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PROJECT TEAM
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PROJECT
THARWA DRIVE DUPLICATION

TITLE
TREE ASSESSMENT PLAN 2

SCALE
1:1000@A3
0 10 20 30 40m

ISSUE
A

JOB NO.
2042

DWG NO.
TA02

JOINS TA02

JOINS TA04

116 *(Populus deltoides)*

G26 *(Mixed Eucalyptus)*

Casuarinas

Shrubs

G27 *(Mixed Eucalyptus)*

G24 *(Casuarina)*

G25 *(Mixed Eucalyptus)*

G24 *(Casuarina)*

398 *(Eucalyptus bridgesiana)*

Shrub

Shrub

G34 *(Mixed Eucalyptus)*

G31 *(Mixed Eucalyptus)*

G37 *(Mixed Eucalyptus)*

G36(*Eucalyptus polyanthemos*)

G35 *(Mixed Eucalyptus)*

THARWA DRIVE

THARWA DRIVE

"POLLUTION TRAP"

GRAVEL

CONC

PATH

GRASS

ABERCROMBIE CIRCUIT

BASTOW CIRCUIT

PLACE

NBN PILLAR

NBN PIT

15 519

7 554

65 404

67 404

68 404

12 5

43 3

23 3

22 3

21 3

20 3

19 3

18 3

31 1

29 221

28 221

1 221

30 221

31 221

32 221

33

35

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PROJECT TEAM: calibre

CLIENT: ACT Government

LANDSCAPE ARCHITECT: enviro links design
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PROJECT: THARWA DRIVE DUPLICATION

TITLE: TREE ASSESSMENT PLAN 3

SCALE: 1:1000@A3 (0 10 20 30 40m)

ISSUE: A

JOB NO.: 2042

DWG NO.: TA03

JOINS TA03

JOINS TA05

THARWA DRIVE

G27 *(Mixed Eucalyptus)*

G28 *(Mixed Eucalyptus)*

G29 *(Mixed Eucalyptus)*

G34 *(Mixed Eucalyptus)*

G35 *(Mixed Eucalyptus)*

751 *(Eucalyptus nortonii)*

G33 *(Mixed Eucalyptus)*

Small *Eucalyptus mannifera (re growth)*

Small *Eucalyptus mannifera (re growth)*

Shrub

Shrub

Wattles

GRASS

CONC

PATH

TELSTRA PIT

ACTEW

WATER RES

OPTUS PIT

81 404 | 27 409 | 18 409 | 19 409 | 25 | 21 408 | 15 408 | 20 410 | 18 410

220 | 13 211

18 222 | 17 222 | 16 222 | 15 222 | 14 222 | 13 222 | 9 222 | 8 222 | 7 222 | 6 222

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CLIENT: ACT Government

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PROJECT: THARWA DRIVE DUPLICATION

TITLE: TREE ASSESSMENT PLAN 4

SCALE: 1:1000@A3 (0 10 20 30 40m)

ISSUE: A

JOB NO.: 2042

DWG NO.: TA04

JOINS TA04

19
410

9
410

30
421

29
421

4

WOODCOCK DRIVE

G31 *(Mixed Eucalyptus)*

G30 *(Eucalyptus melliodora)*

GRASS
Shrubs
CONC PATH
BITUMEN PATH
INET PIT
TELSTRA PIT
LOCKED PIT
POLE NO.616669
CONC
PATH
BITUMEN
THARWA DRIVE
MEMORIAL
POLE NO.613482
POLE NO.913657
POLE NO.613224
OPTUS PIT
390 *(Eucalyptus mannifera)*
434 *(Eucalyptus mannifera)*
432 *(Eucalyptus viminalis)*
G32 *(Mixed Eucalyptus)*
NORMAN LINDSAY STREET
POLE NO.613483

16
211

1
226

2
227

7
227

61
289

BOX HILL AVENUE

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calibre

CLIENT
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PROJECT
THARWA DRIVE DUPLICATION

TITLE
TREE ASSESSMENT PLAN 5

SCALE
1:1000@A3
0 10 20 30 40m

ISSUE
A

JOB NO.
2042

DWG NO.
TA05

ELD No.	Survey No.	Botanical Name	Height (m)	No. Trunks	Trunk circ. (m)	Canopy dia. (m)	Health and Vigour	Structural defects and decay	Past Damage or root disturbance	Disease or infestation	Stage	Quality Rating	Protected Status
							(G-good, F-fair, P-poor, DW-deadwood, EPI-epicormic growth)	(OC- occluded fork, AGL - Above Ground Level)	(AGL - Above Ground Level)	(AGL - Above Ground Level)	Juvenile (J), Semi-mature (SM), Mature (M), Over mature (OM)	Low (L), Poor (P), Medium (M), High (H), Exceptional *(NOTE: Quality Rating also noted with (E) specify an exceptional rating due to heritage listed status)*	**Unleased Land** (Yes - TCCS) ***Tree Act*** (Yes - Y, No - N) - Note: N* denotes a tree **not** regulated due to ACT Declared Weed Species status
G1		Eucalyptus sideroxylon, Eucalyptus melliodora, Eucalyptus mannifera	9 - 20	1	0.6 - 1.2	5 -17	G				SM-M	M	N
G2		Populus alba	16 - 22	1	2.1 - 2.8	6 - 8	F	some past die back - significant in one tree			M-OM	P	N
G3		Cassuarina cunninghamiana	6 - 11	1	0.5 - 0.9	4	G				SM-M	M	N
G4		Eucalyptus sideroxylon	11	1	0.6 - 0.9	11 - 13	G				M-OM	M	N
G5		Cassuarina cunninghamiana, Eucalyptus mannifera	7 - 8.5	1	0.7 - 1.3	5 - 7	G				SM	M-	N
G6		Cassuarina cunninghamiana	7 - 11	1	0.8 - 1.4	5 - 9	G				SM-M	M	N
G7		Cuppressus spp.	5 - 13.8	1	1 - 2	4 - 8	F	form slightly affected by adjacent trees and overshaddowing / competition			SM	P	N
137	137	Eucalyptus mannifera	13.4	1	1.2	10	G				M	M	N
G8		Cassuarina cunninghamiana	11 - 14	1	1 - 1.7	6 - 9	G	some multi trunk trees			SM-M	M+	N
G9		Populus deltoides	12	1	1.2	6	F	some dieback			M	P	N
G10		Eucalyptus mannifera	13 - 15	1	1 - 1.4	8 - 10	G				M	M	N
296	296	Populus deltoides	12	1	2.1	12	P, DW (major)	major epicormic growth, past limb failure			M	P	N
G11		Cassuarina cunninghamiana	5 - 12	1	0.4 - 1.8	3 - 10	G				SM-M	M	N
G12		Eucalyptus mannifera	10 - 16	1	2 - 2.2	9 - 13	G				M	M	N
9	9	Eucalyptus mannifera	14	1	1.7	12	G, DW (minor)				M	M	N
G13		Cassuarina cunninghamiana	4 - 10	1	0.6 - 1.9	2 - 10	G				SM-M	M	N
G14		Eucalyptus mannifera	11 - 12	1	1.4 - 2.7	9 - 17	F, DW	poor form		past insect attack	M	P	N
G15		Cassuarina cunninghamiana	6 - 12	1	0.35 - 2.7	3 - 10	G				SM-M	M	N
138	138	Eucalyptus mannifera	16	1	2.5	17	G	OC (could prune lower limb)			M	M	N
G16		Populus deltoides	12 -13	1	1 - 1.3	9 - 12	P, DW	epicormic growth			SM	P	N
G17		Cassuarina cunninghamiana	14 - 20	1	0.8 - 1	9 - 10	G				SM-M	M	N
G18		Eucalyptus mannifera	13 - 21	1	1.2	10 - 17	G	some past limb failures			M	M	N
G19		Eucalyptus mannifera	14 - 20	1	1 - 2	11 - 17	G	south tree has some die back and is poor form			M	M	N
G20		Cassuarina cunninghamiana	11 - 17	1	0.6 - 1.2	8 - 10	G				M	M	N
G21		Populus deltoides	17 - 24	1	1 - 1.3	6 - 9	F	2 dead, stunted, lopsided canopy			M	P	N
G22		Cassuarina cunninghamiana	15 - 18	1	1 - 1.4	7 - 11	G				M	M	N
G23		Eucalyptus melliodora	6 - 17	1	1 - 1.5	6 - 18	G	3 stunted			SM-M	M	N
G24		Cassuarina cunninghamiana	6 - 19	1	0.4 - 1	4 - 14	G				SM-M	M	N
116	116	Populus deltoides	18	1	1.7	14	F, DW	die back	past limb failure		SM	P	N
G25		Eucalyptus sideroxylon, Eucalyptus melliodora, Eucalyptus nicholii	6 - 14.5	1	0.5 - 1	4 - 9	F-G	stunted and poor form			SM	P	N
G26		Eucalyptus mannifer, Eucalyptus sideroxylon	11 - 14	1	0.8 - 1.3	6 - 10	G				SM-M	M	N
398	398	Eucalyptus bridgesiana	12	1	1.3	8	G	Past limb failure and major OC			M	P	N
G27		Eucalyptus mannifera, Eucalyptus bridgesiana, Eucalyptus polyanthemos	11 - 16	1	1.2 - 1.9	6 - 14	G				SM-M	M	N
748	748	Eucalyptus mannifera	7	1	1.7	5	F-G	multi trunked (regrowth)			SM	P	N
G28		Eucalyptus polyanthemos, Eucalyptus melliodora, Eucalyptus sideroxylon	5.5 - 15	1 - 6	0.5 - 1.6	4 - 9	F	1 dead, 2 poor form/multi trunked/regrowth			SM-M	P	N

ELD No.	Survey No.	Botanical Name	Height (m)	No. Trunks	Trunk circ. (m)	Canopy dia. (m)	Health and Vigour	Structural defects and decay	Past Damage or root disturbance	Disease or infestation	Stage	Quality Rating	Protected Status
							(G-good, F-fair, P-poor, DW-deadwood, EPI-epicormic growth)	(OC- occluded fork, AGL - Above Ground Level)	(AGL - Above Ground Level)	(AGL - Above Ground Level)	Juvenile (J), Semi-mature (SM), Mature (M), Over mature (OM)	Low (L), Poor (P), Medium (M), High (H), Exceptional *(NOTE: Quality Rating also noted with (E) specify an exceptional rating due to heritage listed status)*	**Unleased Land** (Yes - TCCS) ***Tree Act*** (Yes - Y, No - N) - Note: N* denotes a tree **not** regulated due to ACT Declared Weed Species status
G29		Eucalyptus sideroxylon, Eucalyptus melliodora	12 - 16	1	1 - 1.6	6 - 11	F-G				M	M	N
G30		Eucalyptus melliodora	12.9 - 17.8	1	1 - 2.2	5 - 9	G				M	M	N
G31		Eucalyptus mix	9.1 - 16.5	1	0.8 - 1	6 - 12	G				M	M	N
G32		Eucalyptus mix	5.5 - 9.7	1	0.7 - 1.3	8 - 14	G				SM	M-	N
432		Eucalyptus viminalis	9.2	1	1.3	8	F, DW	on a lean			SM	P	N
434		Eucalyptus mannifera	13.4	6	5.9	12	G	multi trunked	OC		M	M-	N
390	390	Eucalyptus mannifera	12	6	2.7	11	G	multi trunked	OC		M	M-	N
G33		Eucalyptus melliodora, Eucalyptus mannifera	10 - 13	1	1- 2	8 - 10	G				M	M	N
751	751	Eucalyptus nortonii	13	1	1.3	14	G	birds observed in tree			M	M	N
G34		Eucalyptus polyanthemos, Eucalyptus mannifera, Eucalyptus melliodora, Eucalyptus sideroxylon	7 - 11.5	1 - 3	0.6 - 1.6	3 - 14	G	some multi trunked			M	M	N
G35		Euclyptus polyanthemos, Eucalyptus mannifera, Eucalyptus melliodora	8 - 13	1	0.8 - 1.4	5 - 10	G	good form			M	M	N
G36		Eucalyptus polyanthemos	5 - 15	1	0.3 - 0.8	2.5 - 12	G				M	M	N
G37		Eucalyptus mix	7 - 24	1	0.5 - 1.9	5 - 12	G				SM-M	M	N

Appendix F Noise Assessment

CALIBRE CONSULTING

THARWA DRIVE DUPLICATION

FEASIBILITY ROAD NOISE ASSESSMENT

DECEMBER 2020

Question today
Imagine tomorrow
Create for the future

Tharwa Drive Duplication
Feasibility Road Noise Assessment

Calibre Consulting

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REV	DATE	DETAILS
0	14 December 2020	Issue

	NAME	DATE	SIGNATURE
Prepared by:	[redacted]	14 December 2020	[redacted]
Reviewed by:		14 December 2020	
Approved by:		14 December 2020	

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EXECUTIVE SUMMARY

WSP Australia Pty Ltd has conducted a preliminary road noise assessment for the Feasibility Study of the proposed duplication of Tharwa Drive in Tuggeranong.

This noise assessment has been completed to determine the potential noise impact of the duplication of an existing road on existing residences surrounding the Project area. All assessments are conducted in accordance with the Roads ACT Noise Management Guidelines (2018).

An analysis of existing traffic volumes and a high-level assessment of potential noise impacts has been conducted to understand the implications of the Project and to understand the potential noise mitigation and managements that may be required.

The following findings are made based on analysis of the noise monitoring and traffic count results as well as review of traffic forecast (2041) and duplication concept design:

- Overall, the duplication project is not expected cause acoustically significant change in noise levels. Residential receivers to the west of the duplication are expected to experience a noise level increase of <2dB. Residential receivers to the east of the duplication are expected to experience a decrease in noise levels or minimal change.
- Residential receivers to the east of the road alignment between Woodcock Drive and Box Hill Avenue would likely experience slight decrease or minimal change in road noise levels. **Consideration of noise mitigation expected not to be required**.
- Residential receivers to the west of the road alignment between Woodcock Drive and Box Hill Avenue would likely experience increase of noise levels of <2dB, which is generally considered acoustically insignificant. However, **consideration of noise mitigation expected to be required** in strict adherence Roads ACT Noise Management Guidelines, which require road noise levels to not increase above existing levels.
- Residential receivers to the east of the road alignment between Box Hill Avenue and Pockett Avenue would likely experience slight decrease or minor change in road noise levels. **Consideration of noise mitigation expected not to be required**.
- Residential receivers to the west of the road alignment between Box Hill Avenue and Pockett Avenue would likely experience increase of noise levels of <2dB, which is generally considered acoustically insignificant. Future road noise levels are expected still be ≤60 dB $L_{Aeq, 15hr}$, which is the planning guideline level of absolute road noise levels for these receivers. **Consideration of noise mitigation expected not to be required**.
- Limitations: it should be noted that the findings above are based on the high level noise assessment undertaken as described in this feasibility study. These findings are subject to more detailed noise modelling and assessment in future planning stages and may change.

1 PROJECT BACKGROUND

WSP Australia Pty Ltd (WSP) has been engaged by Calibre Consulting to complete a feasibility road noise assessment for the proposed duplication of Tharwa Drive in Tuggeranong.

Tharwa Drive is an arterial road, providing a north-south connection from the suburb of Banks to Tuggeranong. Tharwa Drive between Woodcock Drive and Pockett Avenue comprises a 1.8 km single lane roadway with a posted speed limit of 80 km/h. We understand that Transport Canberra City Services (TCCS) is looking to duplicate this roadway to form a dual-lane carriageway ("the Project").

This noise assessment has been completed to determine the potential noise impact of the duplication of an existing road on existing residences surrounding the Project area. An analysis of existing traffic volumes and a high-level assessment of potential noise impacts has been conducted to understand the implications of the Project as part of the Feasibility Study for the Project, and to understand the potential noise mitigation and managements that may be required as a result of TCCS carrying out the Project. This assessment has been completed in accordance with the Roads ACT Noise Management Guidelines (Transport Canberra and City Services 2018).

The study area for this noise assessment is presented in Figure 1.1.

Figure 1.1 Proposed Tharwa Drive Duplication – Project Study Area

2 ROADS ACT NOISE MANAGEMENT GUIDELINES

Operational road noise assessments in the ACT are assessed in accordance with the Roads ACT Noise Management Guidelines (NMG) (Transport Canberra and City Services 2018).

The NMG provides road traffic noise planning guideline levels for upgrades to existing roads in existing areas based on the land / building usage.

Section 7 of the NMG states that "proposals for upgraded roads in existing noise sensitive developed areas will require an assessment against the guidelines contained in Schedule 3", reproduced in Table 2.1.

Table 2.1 Extract of Schedule 3: Guidelines for upgraded roads in existing areas

OBJECTIVE	TECHNIQUE	CRITERIA
To protect residents of existing areas from excessive increases in levels of traffic noise	acoustic barrier between buildings and the road AND/OR acoustic treatment of existing buildings	Traffic noise levels as set out in Table 1.3 measured at adjacent noise-sensitive land uses and based on the predicted maximum traffic flow[1] on the new or upgraded road.

(1) Long-term traffic forecasts are available from EPD's Major Projects and Transport Unit.

Source: Roads ACT Noise Management Guidelines (NMG) (Transport Canberra and City Services 2018).

Table 1.3 of the NMG outlines noise planning guidelines applicable to the project, as summarised in Table 2.2.

Table 2.2 Extract of Table 1.3 Traffic noise levels resulting from upgraded roads in existing areas of noise sensitive land use, expressed as LAeq dB(A) Daytime, Ground Level

EXISTING TRAFFIC NOISE LEVEL AT ADJACENT BUILDINGS[1]	TRAFFIC NOISE LEVEL AT ADJACENT BUILDINGS AFTER ROAD WORKS COMPLETED
> 60	equal to existing level (Not greater than 65)
55 - 60	60
< 55	not more than 5 dB(A) above existing level

(1) The traffic noise levels incorporate an allowance for reflection from the facade of the building under investigation. Measurements should be taken at one metre forward of the building facade. In cases where the building is not yet constructed, measurements should be taken at a distance of one metre in front of the proposed building facade, or one metre forward of the minimum set-backs required under the Territory Plan, and 2.5 dB(A) added to the measurement to allow for future facade reflection. Measurements should be taken at a height of 1.2 - 1.5 metres above ground level.

Source: Roads ACT Noise Management Guidelines (NMG) (Transport Canberra and City Services 2018).

3 EXISTING NOISE ENVIRONMENT

Noise monitoring was conducted at three residential receivers along Tharwa Drive to gain an understanding of the existing road traffic noise levels at these residential premises. Concurrent traffic counts were undertaken at two representative locations along Tharwa Drive.

Noise monitoring and traffic count locations are depicted in Figure 3.1. The results are presented in Appendix A. The Project area has been separated into separate Noise Catchment Areas (NCAs). Receivers have been grouped into the respective NCA based on their location and similar noise environments west and east of the alignment, as presented in Table 3.1.

Table 3.1 Noise catchment areas

NOISE CATCHMENT AREA	DESCRIPTION
NCA1	Residential receivers to the east of the alignment between Woodcock Drive and Box Hill Avenue
NCA2	Residential receivers to the east of the alignment between Box Hill Avenue and Pockett Avenue
NCA3	Residential receivers to the west of the alignment between Box Hill Avenue and Pockett Avenue
NCA4	Residential receivers to the west of the alignment between Woodcock Drive and Box Hill Avenue

Noise monitoring was conducted with unattended environmental noise loggers. The equipment was commissioned, set up and retrieved by Rebecca Warren and Linnea Eriksson, Acoustic Engineers and Members of the Australian Acoustical Society. Measurements were performed in general accordance with the *ACT Noise Measurement Manual*. The instrument signal calibration was conducted at the commencement and conclusion of the noise measurements, with the variation in recorded calibrated levels not exceeding ±1.0 dB.

Noise monitoring equipment was programmed to record continuously statistical noise level indices in 15 minute intervals with A-weighting and fast time response, including L_{max}, L_1, L_{10}, L_{50}, L_{90}, L_{99}, L_{min}, and L_{eq}.

3.1 NOISE MONITORING LOCATIONS

Noise monitoring was conducted at three locations near the Project area in November 2020. The purpose of the noise monitoring was to establish both the existing background noise levels and existing road traffic noise levels at potential sensitive receivers. Table 3.2 summarises the equipment used and Figure 3.1 presents the noise monitoring locations.

Table 3.2 Noise monitoring equipment

ID	DATES	EQUIPMENT DESCRIPTION	LOCATION	REFLECTION	MANUFACTURER & TYPE NO.	SERIAL NO.
N01	17 to 25/11/2020	Environmental Noise Monitor	38 Dixson Circuit, Conder	None (free-field)	Norsonic	1404791
N02	3 to 10/11/2020	Environmental Noise Monitor	42 House Circuit, Banks	None (free-field)	Ngara	878099
N03	3 to 10/11/2020	Environmental Noise Monitor	13 Coventry Close, Gordon	None (free-field)	Rion	NL 42
All	All	Calibrator	All	-	NC-74	34315156

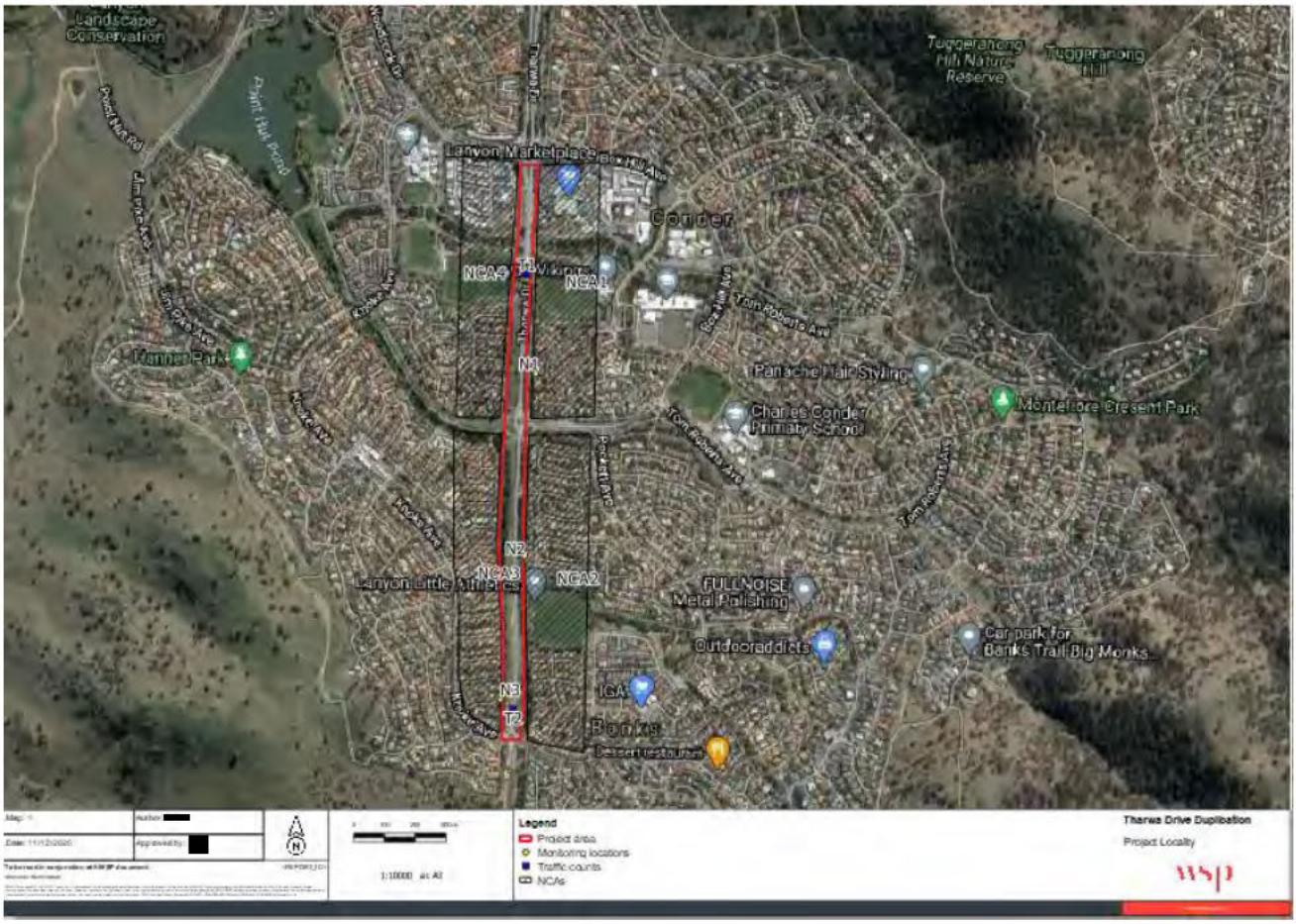


Figure 3.1 Noise catchment areas, noise monitoring locations and traffic count locations

The data were gathered during a period of typical traffic movement and activity in the area (i.e. outside of school holiday periods or major festivities).

Noise monitoring data were processed to remove adverse meteorological conditions (winds >5 m/s and rainfall) based on meteorological data sourced from Bureau of Meteorology (BoM) station 70351 (Canberra).

3.2 NOISE MONITORING RESULTS

Table 3.3 summarises the results of the ambient road traffic noise monitoring over the monitoring period. Appendix A presents weekly monitoring summaries.

Table 3.3 Unattended measured road traffic noise levels (façade corrected)

LOCATION ID	MEASURED ROAD TRAFFIC NOISE LEVEL, dBA	
	Day $L_{eq,\ 15hr}$	Night $L_{eq,\ 9hr}$
N01 (Dixson Circuit)	61	54
N02 (House Circuit)	57	50
N03 (Coventry Circuit)	56	49

Noise levels are façade corrected noise levels using a +2.5 dB façade correction.

The results of Table 3.3 indicate that the existing façade corrected noise levels at N01 (Dixson Circuit), located north east of the alignment in NCA1 currently exceed the regulatory noise planning levels for existing developments near existing

roads (refer to Section 2). Receivers to the west of the alignment in NCA4 between Woodcock Drive and Box Hill Avenue, are likely to experience a similar noise environment to that of NCA1, however noise levels may be marginally lower (1 dBA) based on increased distance to the Tharwa Drive alignment.

Noise levels at N02 and N03, representative of receivers south east and south west of the alignment (NCA2 and NCA3) currently experience noise levels between 55 and 60 dBA.

Based on the background noise investigations, it is anticipated that future planning limits would be limited to 61 dBA at receivers in NCA1 and NCA4 and 60 dBA for receivers in NCA2 and NCA3.

3.3 TRAFFIC COUNT RESULTS

The traffic counting survey was conducted for three weeks between 5 and 25 November 2020 by Trans Traffic Consultants. Traffic counts were undertaken on Tharwa Drive at two locations presented in Figure 3.1. Data collected during this traffic counting survey was used to assist in validating the road noise measurements, discussed further in Section 4 of this report. These volumes are used solely for the purpose of assessment of existing conditions.

Table 3.4 summarises the traffic volumes and speeds observed during the noise monitoring period averaged over the monitoring period; weekly results are presented in Appendix B.

Table 3.4 Measured traffic volumes during background noise monitoring, Year 2020

ROAD	DIRECTION	DAY[1]			NIGHT[1]		
		Vehicles per 15 hour	Percent heavy vehicles	Traffic speed (mean, 85th percentile), km/h	Vehicles per 9 hour	Percent heavy vehicles	Traffic speed (mean, 85th percentile), km/h
Tharwa Drive between Norman Lindsay Dr and Box Hill Ave (T1)	Northbound	6,049	4%	69, 77	833	7%	71, 79
	Southbound	6,519	4%	70, 77	392	3%	71, 80
Tharwa Drive between Box Hill Ave and Pockett Ave (T2)	Northbound	3,268	4%	70, 77	439	6%	70, 77
	Southbound	3,615	4%	71, 77	286	3%	70, 77

(1) Day (7am to 10pm), night (10pm to 7am).

Source: Trans Traffic (2020).

4 NOISE ASSESSMENT

4.1 METHODOLOGY

An assessment of potential noise impact has been completed based on a review of the measured road traffic noise levels and concurrent traffic counts conducted in November 2020.

The implications of the proposed duplication and projected traffic forecasts for future years was conducted to provide a high-level overview of potential impacts on sensitive receivers compared to existing noise levels, and indicative high level mitigation requirements that may be triggered to manage noise levels.

4.2 PROPOSED ALIGNMENT CHANGES

Based on a review of the proposed duplication and realigned road carriageways, it is understood the proposed duplication will see the existing road alignment duplicated approximately 8 m west of the existing carriageway.

This will have the effect of moving operational traffic away from the more exposed receivers to the east of the study area (NCA1 and NCA2) and will potentially reduce noise levels as a result of spreading the acoustic source further away from the exposed receivers. Conversely, this will move the alignment closer to exposed receivers to the west of the road alignment (NCA3 and NCA4).

4.3 TRAFFIC FORECASTS

Traffic forecasts for the project were provided by Canberra Strategic Transport Model (CSTM), providing projections at three locations of Tharwa Drive for years 2021 and 2041 (it is noted that 2031 forecast is also available however the noise assessment is based on the furthest forecast year to allow a more conservative assessment). These volumes have been adopted for use in this assessment, and traffic volumes for the project assessment years have been developed using the following assumptions:

- Peak hour traffic volumes (total of morning and afternoon peak hour volumes) were assumed to equate to 20% of the average annual daily traffic volumes
- Heavy vehicle percentages for future traffic projections were adopted from measured traffic data

A summary of the forecast modelled traffic volumes is provided in Table 4.1.

Table 4.1 Forecast traffic volumes – Tharwa Drive

DIRECTION	PERIOD[1]	2021 FORECAST TRAFFIC VOLUMES			2041 FORECAST TRAFFIC VOLUMES		
		Light	Heavy	Total	Light	Heavy	Total
Tharwa drive - Woodcock to Norman Lindsay							
North Bound	Day[1]	5645	244	5889	6133	265	6399
	Night[1]	758	53	811	824	58	881
South Bound	Day	4784	201	4985	5264	221	5485
	Night	291	9	300	321	10	330
Tharwa drive - Norman Lindsay to Box Hill (S)[2]							
North Bound	Day	5666	245	5911	6226	269	6495
	Night	761	53	814	836	59	895
South Bound	Day	4856	204	5060	5359	225	5584
	Night	296	9	305	326	10	336
Tharwa drive - Box Hill (S) to Pockett Ave[3]							
North Bound	Day	2760	119	2879	2988	128	3117
	Night	363	23	386	393	25	418
South Bound	Day	1785	83	1867	2440	113	2553
	Night	144	4	148	197	5	202

(1) Day (7am to 10pm), night (10pm to 7am).

(2) Comparative traffic count location: T1 (South of Norman Lindsay St)

(3) Comparative traffic count location: T2 (North of Pockett Avenue)

Source : CSTM

Traffic projections for 2041 were found to increase reasonably consistently with respect to 2021 numbers, with up to an approximately 10% increase for northbound and southbound flows in the morning period. Night time volumes were found to increase by up to 10 % for Woodcock to Norman Lindsay and Norman Lindsay to Box Hill (S).

Volumes on the Box Hill (S) to Pockett Avenue portion are predicted to increase by 5% northbound and increase by nearly 50% southbound during the night period. This may result in notable increases in received noise levels at the nearest receivers during the night, however it is noted that the planning guidelines do not provide guidance for night time period flows, therefore this impact would be minimal risk to the project.

4.4 FORECAST CORRELATIONS TO MEASURED LEVELS

Based on the forecast traffic volumes for the project, a comparison has been made with the measured traffic volumes presented in Table 3.4.

Correlations have been made between the traffic forecasts for the relevant portions of the duplication, between measured levels at T1 and forecasts at Norman Lindsay to Box Hill (S), and T2 and Box Hill (S) to Pockett Avenue. It is assumed that levels at Woodcock to Norman Lindsay would be consistent with Norman Lindsay to Box Hill (S).

The following observations have been made:

- Traffic volumes projected for 2021 are approximately consistent with the existing traffic volumes for northbound flows, with forecast values for 2021 slightly lower than the traffic counts, 2% to 10% lower respectively for flows between Norman Lindsay to Box Hill and Box Hill (S) to Pockett Avenue respectively.
- Southbound flows were found to be notably lower than measured, with flows 22% and 52% lower than the measured traffic counts between Norman Lindsay to Box Hill and Box Hill (S) to Pockett Avenue respectively.

As a result, the predictions made in this report are likely to be non-representative based on the findings of the traffic counting surveys conducted as part of this investigation, and may lead to underpredicting real world impacts.

It is recommended that future assessment involve a more detailed investigation into traffic volumes and splits to provide a more conservative estimate of potential impacts as a result of the Project.

4.5 POTENTIAL NOISE IMPACT OF PROJECT

Preliminary desktop calculations have been completed based on the available project information and traffic forecast data, as well as traffic forecast (2041) and duplication concept design data to provide an indicative assessment of potential noise impacts as a result of the Project. These calculations have considered the following:

- existing measured noise levels and traffic counts
- forecast traffic volumes for 2041
- changes in alignment as a result of the Project, based on available concept information.

Overall it is considered that the Project will not significantly change noise levels at the nearest sensitive receivers.

Based on the projected increases between 2021 to 2041, noise levels are generally predicted to increase by less than 1 dB for northbound and southbound traffic, with southbound flows on Box Hill (S) to Pockett Avenue to increase by up to 2 dB as a result of changes in traffic volumes.

Noise levels are anticipated to broadly decrease to residential receivers to the east of the alignment (NCA1 and NCA2), and increase west of the alignment (NCA3 and NCA4) due to the geometric spreading of the noise sources as a result of the realigned road carriageway.

Preliminary findings indicate that due to the duplication, northbound traffic lanes will move traffic away from sensitive receivers east of the alignment in NCA1 and NCA2, with noise levels to reduce by up to 0.7 dB at the nearest residences to the alignment.

It is considered that any increases due to increases in traffic volume would be balanced out by the geometric spreading associated with the introduction of additional lanes away from sensitive receivers in NCA1 and NCA2. As discussed in Section 3.3, it is anticipated that future planning limits would be limited to 61 dBA at receivers in NCA1, as existing noise levels in NCA1 are currently exceeding the noise planning guideline value of 60 dBA, and future planning limits would be limited to 60 dBA for receivers in NCA2. As a result, it is considered that receivers in NCAs 1 and 2 are likely to experience a slight reduction in noise levels as a result of the Project, and mitigation is not expected to be required, based on these preliminary findings.

Noise levels at receivers west of the alignment will experience some increase in noise levels as a result of the additional lanes moving traffic closer to receivers. Noise levels are predicted to increase by 0.7 dB in NCA4 and 0.9 dB in NCA3.

Noise levels are currently below relevant guidance levels in NCA3 (currently measured at 57 dBA L_{eq}), and future planning limits would likely be limited to 60 dBA for receivers in NCA3 (refer to Section 3.3). As discussed in Section 3.3 it is likely that existing noise levels in NCA4 are currently around 60 dBA, therefore the future noise management level would be set at 60 dBA (i.e. no increase to noise levels as a result of the Project).

The addition of extra lanes to the west of the alignment will increase noise levels to receivers in NCA3 and NCA4, however these increases are estimated at less than 1 dB. As a result, it is considered that mitigation for receivers in NCA3 is not expected to be required, based on these preliminary findings. However, consideration of noise mitigation is likely to be required in NCA4 in strict accordance with the guidelines, as there is a risk that future noise levels may exceed 60 dBA. Increase in noise levels are however expected to be limited to <2 dB, which is typically considered insignificant and not likely perceptible.

During further studies, based on the assessment presented in Section 4.4 it is recommended that noise traffic forecasts be reconsidered or based on the measured traffic counts presented in this report.

5 MITIGATION

This section provides a discussion on possible mitigation options available to reduce the potential road noise impact on sensitive receivers.

Reiterating previous discussions, it should however be noted it may not be feasible and reasonable to consider mitigation as the Project will not significantly change noise levels at the nearest sensitive receivers. Noise levels are expected to be limited to <2 dB, which is typically considered insignificant and not likely perceptible. It is therefore likely acceptable to proceed without specific noise mitigation, subject to further studies and consultation with stakeholders (e.g. TCCS, EPSDD).

Noise mitigation strategies are typically investigated in a hierarchical fashion as follows:

- Mitigation at the source (generally most preferable and recommended first)
- Mitigation along the noise transfer path
- Mitigation at the receiver (generally least preferable).

5.1 PLANNING OF ROAD CORRIDOR

In general, where possible, investigation should be undertaken to determine if there is an opportunity to position/realign roads away from sensitive receivers as additional separation distance will promote better acoustic outcomes.

The current design is already favourable in this regard as the new carriageways are positioned opposite from the sensitive receivers both in NCA1 and NCA2. This moves about half of the total traffic along the road corridor further away from all sensitive receivers.

Any further alignment changes for Tharwa Drive will likely be limited, as the road is generally constrained within an existing road corridor and run alongside other privately owned lands.

The associated effectiveness is however dependent on the degree of change. Theoretically, a doubling of setback distance approximately equates to a noise level difference of 3 dB. An initial review indicated that a realignment of the road outside of the existing designated road corridor would be required to achieve a noticeable difference acoustically. This option is therefore not likely to be feasible. Further investigation should be undertaken to determine the optimal degree of changes if this is pursued.

5.2 MITIGATION AT NOISE SOURCE

For a road noise source, this option typically involves strategies such as using a quieter road pavement type or reducing the speed limit. It should be noted that a quieter road pavement type has the potential to provide up to 2 dB in noise reduction (e.g. when comparing the use of low noise Stone Mastic Asphalt against Dense Graded Asphalt). It is however noted that this option has previously been rejected by TCCS due to requirement to maintain the pavement surface.

5.2.1 SPEED LIMIT REDUCTION

The modelled base case for the 2041 scenario assumed a sign-posted speed limit of 80 km/hr. Theoretically, a reduction in traffic speed along the entire Tharwa Drive alignment in both directions will potentially result in the following noise reduction:

- Up to 0.5 to 1.0 dB noise reduction by reducing traffic speed from 80 km/hr to 70 km/hr.
- Up to 1.5 to 2.0 dB noise reduction by reducing traffic speed from 80 km/hr to 60 km/hr.

Dependent on the degree of speed reduction implemented, such measure has the potential in providing up to 2 dB of noise reduction. When in combination with other measures (e.g. quieter road pavement), can provide a notable decrease in road traffic noise levels.

It should however be noted that existing Tharwa Drive contain sections of 80 km/hr and 60 km/hr. Shall a lower speed limit be implemented entirely along the road corridor, it may be difficult to change drivers' behaviour. If speed reduction is implemented as a noise mitigation strategy, it is therefore recommended that additional strategies be considered in ensuring the speed limit will be adhered to. This may include additional signage to discourage driving over the speed limit, traffic safety cameras or the like.

5.3 MITIGATION ALONG THE NOISE TRANSFER PATH

This option typically involves the use of noise barrier(s) to break direct line of sight between the road traffic and receivers. It should be noted that noise barriers are typically most effective if they are close to the source or the receiver. The most common types of barriers are typically in the form of solid property boundary fences and/or road-side barriers. It is typically accepted that a noise barrier is considered feasible and reasonable if it provides a noise reduction of at least 3 to 5 dB.

It should however be noted that the overall mitigation strategies will be subject to further assessment by the project team. Implementation of noise barriers is expected to change the aesthetics of the project area significantly and may not be considered feasible for the following reasons and reasonable:

- The proposed duplication will either cause noise levels to decrease or increase by a level that is not likely to be perceptible (less than 2 dB), when compared to "doing nothing" to the road. Significant consideration of mitigation (e.g. in the form of noise barrier) is therefore not likely to be considered reasonable.
- If other mitigation measures are considered per discussed in Section 5.2, the proposed duplication will cause noise levels to decrease at all locations.
- Further investigation will be required to determine the feasibility of noise barriers from perspectives other than acoustics.

5.4 MITIGATION AT THE RECEIVER

It should be noted that provision of mitigation at the receivers is typically left as a last resort when other strategies are demonstrated to be not feasible. It should be noted that any treatment provided to the receiver buildings does not generally provide improvement to outdoor noise levels, which implies that the applicable planning guidelines will still be exceeded. Notwithstanding, such strategies may at times be a more preferable option from the community's perspective. Provision of mitigation at the receivers may include one of more of the following:

- Replace existing fence with suitable sound insulating material at a certain height.
- Visual inspection of the subject properties to determine the existing condition.
- Retrofit works to fix acoustically effective perimeter seals to doors and/or windows.
- Closing, filling and sealing up any gaps/vents that may be present on the building facades.
- Replacement of windows with systems with better sound insulating qualities.
- Installation of secondary windows system.
- Provision of alternative mechanical ventilation system to allow outdoor air circulation.

Subsequent to consideration of mitigation at the source and/or noise barriers, further investigation should be conducted to gain an appreciation of the preferred and most appropriate mitigation measures. As the proposed duplication was not

predicted to result in noticeable additional impact (and the fact that it causes noise to decrease in certain locations), implementation of property treatments is therefore not likely to be considered reasonable.

6 CONCLUSION

WSP Australia Pty Ltd (WSP) has conducted an operational road noise impact assessment to support the Feasibility Study for the Tharwa Road Duplication Project.

This noise assessment has been completed to determine the potential noise impact of the duplication of an existing road on existing residences surrounding the Project area. All assessments are conducted in accordance with the Roads ACT Noise Management Guidelines (2018).

An analysis of existing traffic volumes and a high-level assessment of potential noise impacts has been conducted to understand the implications of the Project as part of the Feasibility Study for the Project, and to understand the potential noise mitigation and managements that may be required.

The following findings have been made based on analysis of the noise monitoring and traffic count results as well as review of traffic forecast (2041) and duplication concept design:

- Overall, the duplication project is not expected cause acoustically significant change in noise levels. Residential receivers to the west of the duplication are expected to experience a noise level increase of <2dB. Residential receivers to the east of the duplication are expected to experience a decrease in noise levels or minimal change.
- Residential receivers to the east of the road alignment between Woodcock Drive and Box Hill Avenue would likely experience slight decrease or minimal change in road noise levels. **Consideration of noise mitigation expected not to be required**.
- Residential receivers to the west of the road alignment between Woodcock Drive and Box Hill Avenue would likely experience increase of noise levels of <2dB, which is generally considered acoustically insignificant. However, **consideration of noise mitigation expected to be required** in strict adherence Roads ACT Noise Management Guidelines, which require road noise levels to not increase above existing levels.
- Residential receivers to the east of the road alignment between Box Hill Avenue and Pockett Avenue would likely experience slight decrease or minor change in road noise levels. **Consideration of noise mitigation expected not to be required**.
- Residential receivers to the west of the road alignment between Box Hill Avenue and Pockett Avenue would likely experience increase of noise levels of <2dB, which is generally considered acoustically insignificant. Future road noise levels are expected still be ≤60 $L_{Aeq, 15hr}$, which is the planning guideline level of absolute road noise levels for these receivers. **Consideration of noise mitigation expected not to be required**.

A more detailed investigation into traffic volumes and splits is recommended to provide a more realistic estimate of potential impacts as a result of the Project. Existing background noise levels in NCA4 should be investigated at a suitable receiver location as part of future investigations to confirm the assumptions made in this report.

APPENDIX A

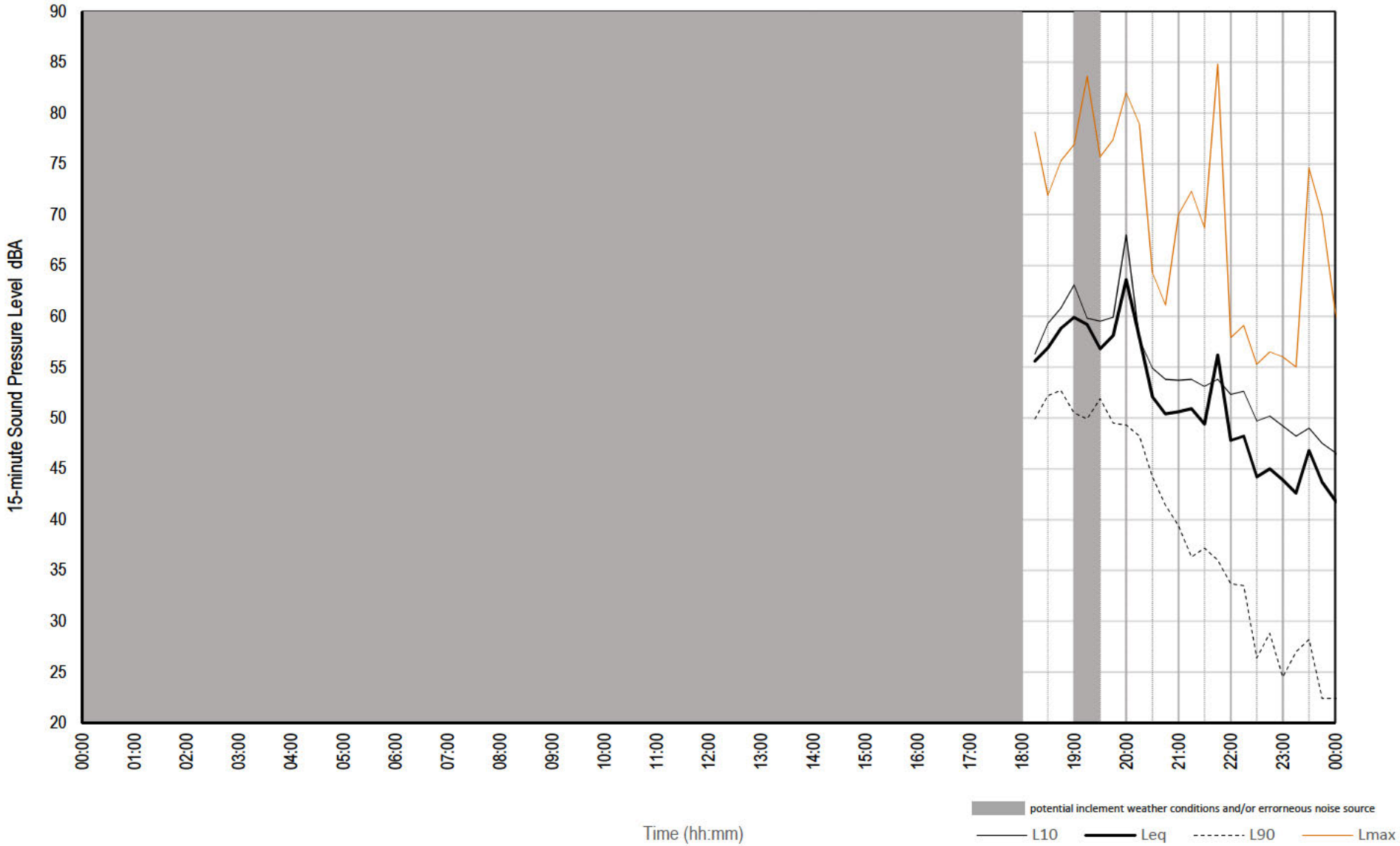
NOISE MONITORING DATA

A1 WEEKLY DATA

A1.1 NM1

Measured Noise Levels - L3 - 38 Dixson Cct

Tuesday, 17 November 2020



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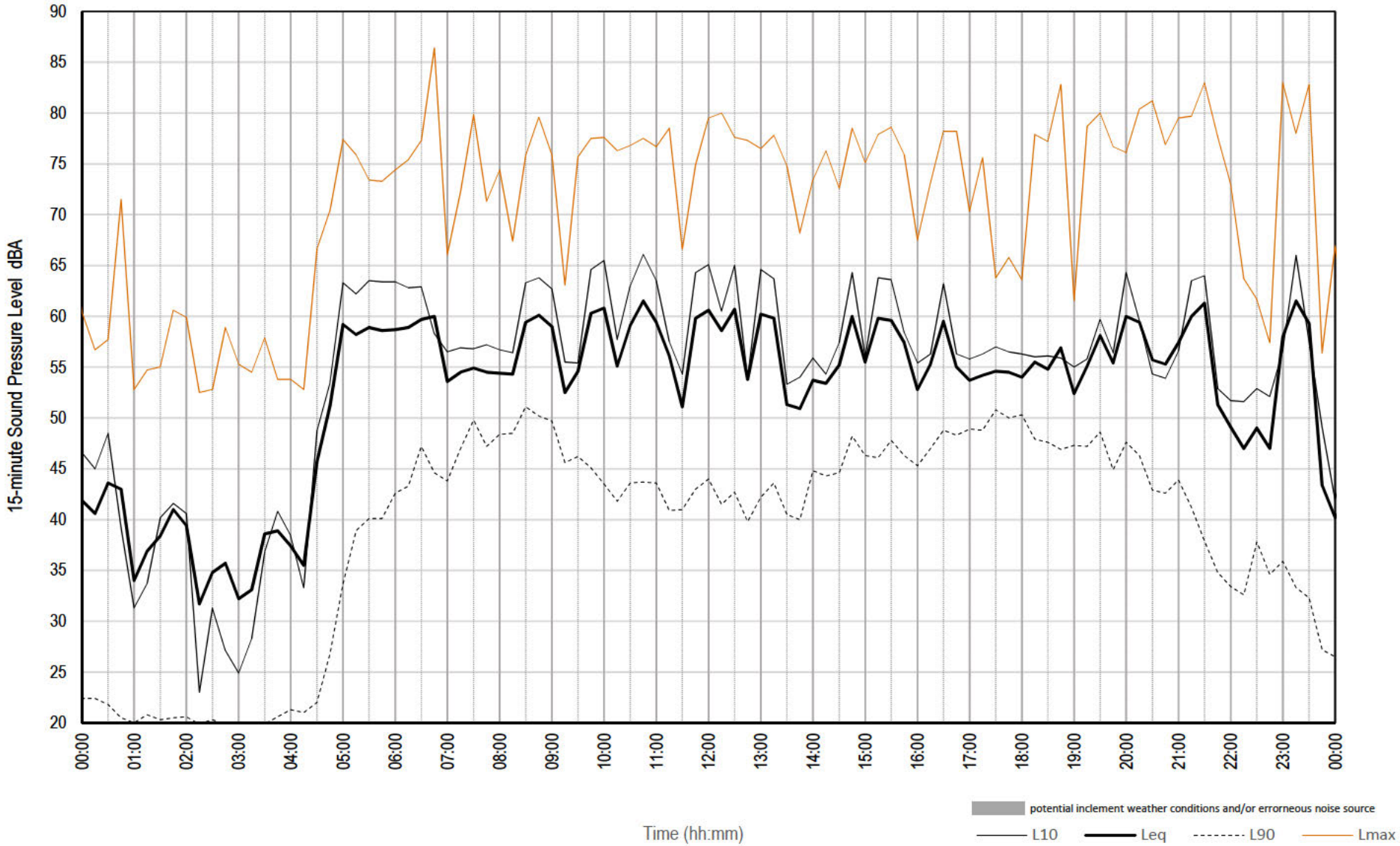
Measured Noise Levels - L3 - 38 Dixson Cct

Wednesday, 18 November 2020



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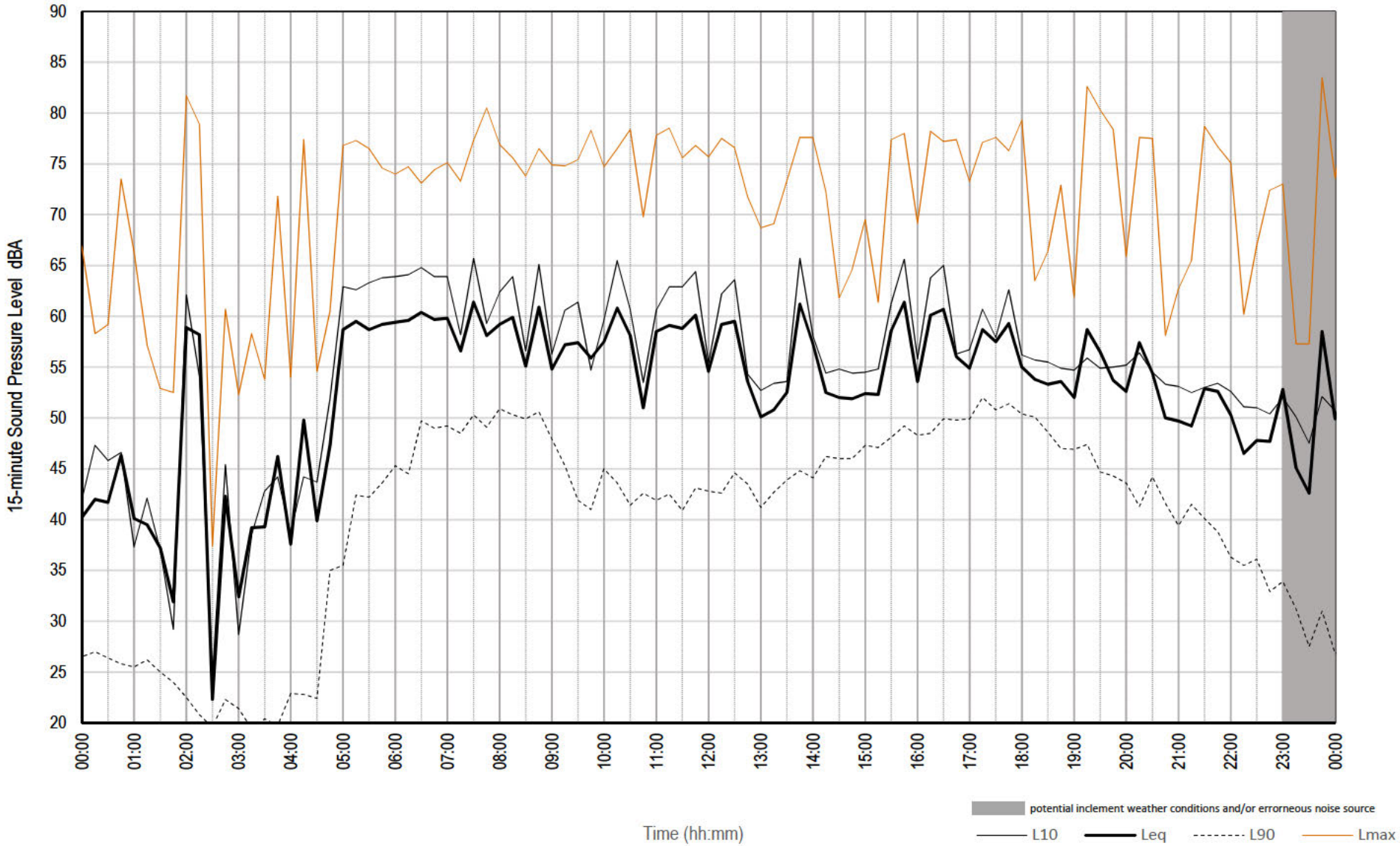
Measured Noise Levels - L3 - 38 Dixson Cct

Thursday, 19 November 2020



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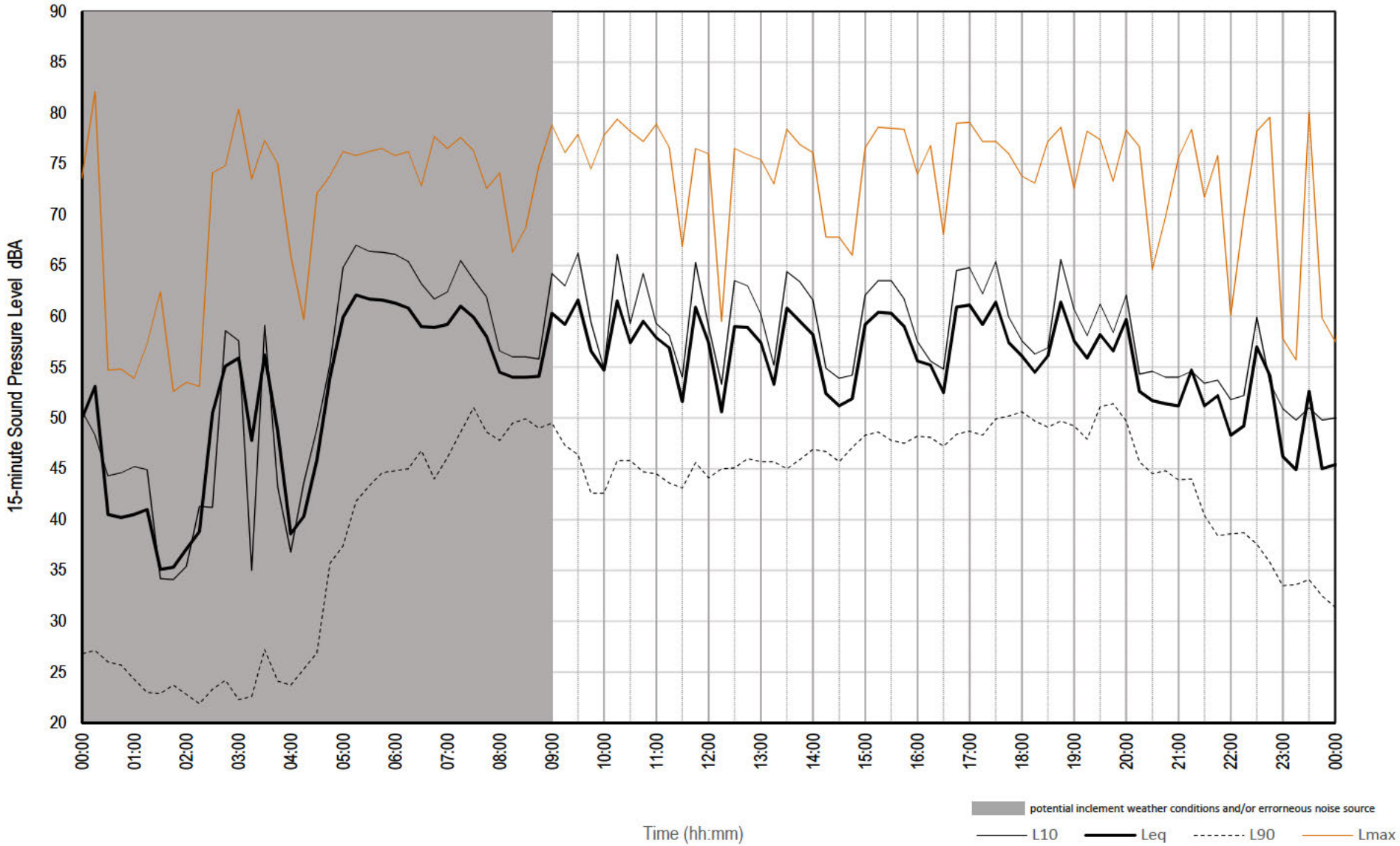
Measured Noise Levels - L3 - 38 Dixson Cct

Friday, 20 November 2020



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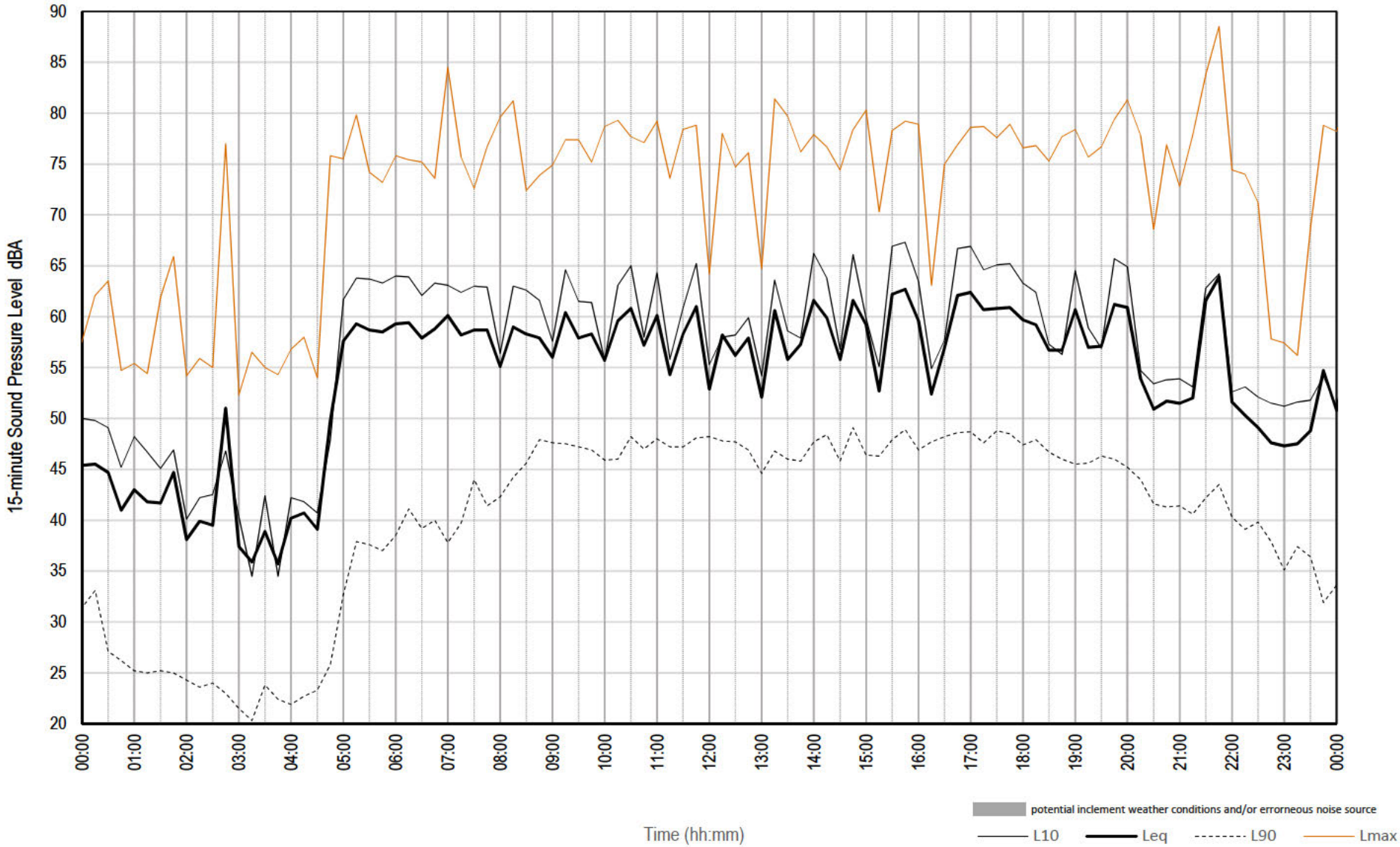
Measured Noise Levels - L3 - 38 Dixson Cct

Saturday, 21 November 2020



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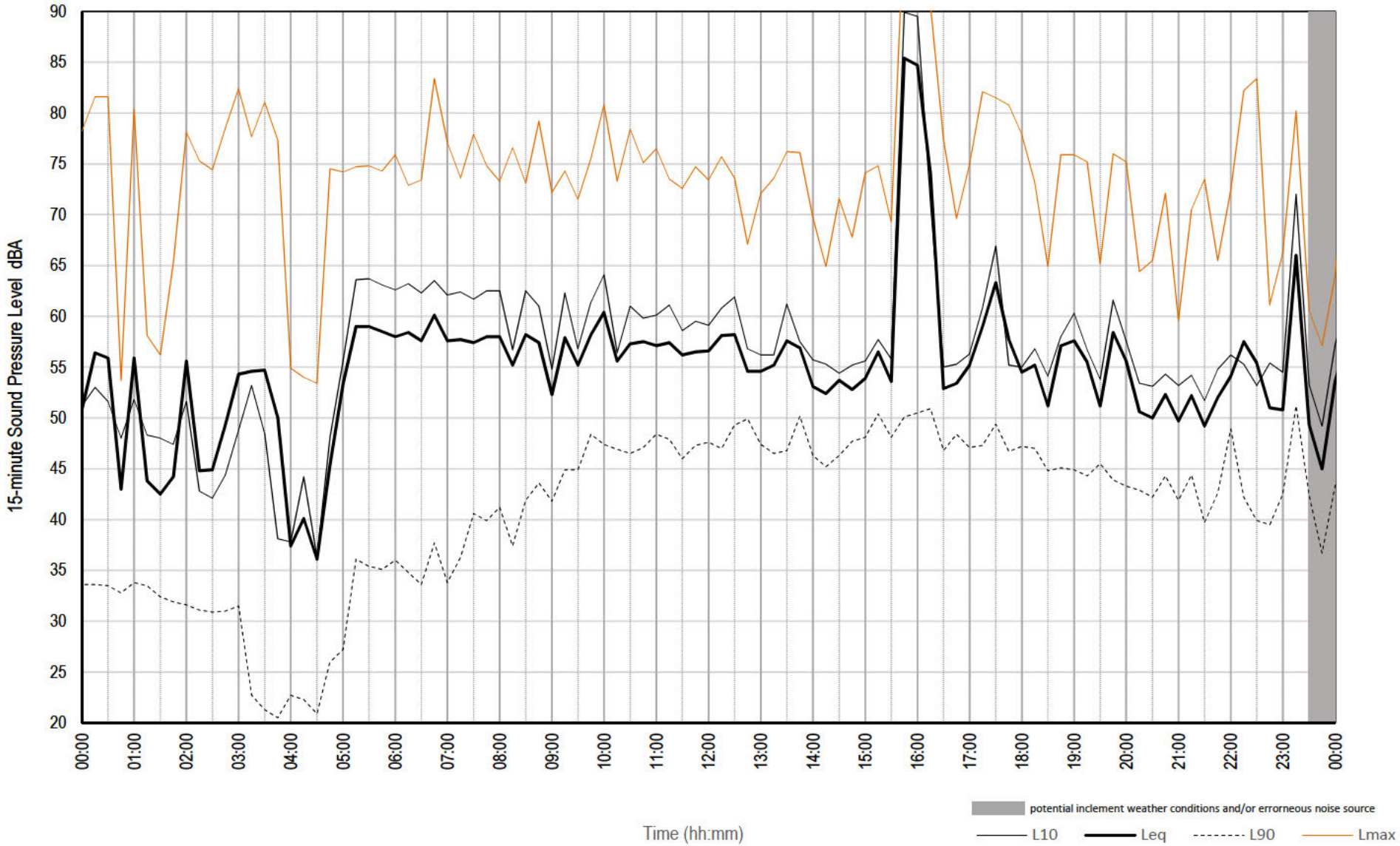
Measured Noise Levels - L3 - 38 Dixson Cct

Sunday, 22 November 2020



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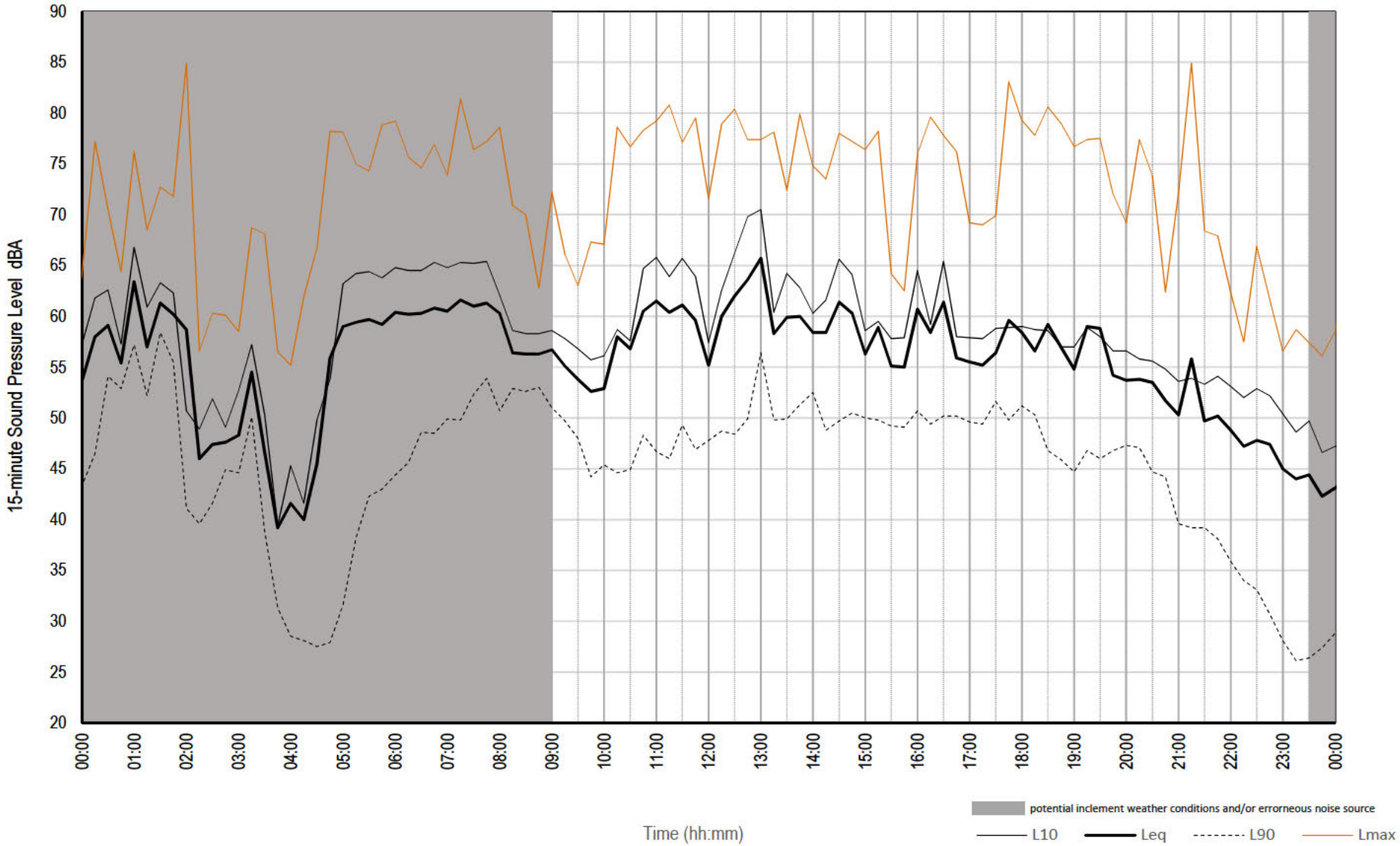
Measured Noise Levels - L3 - 38 Dixson Cct

Monday, 23 November 2020



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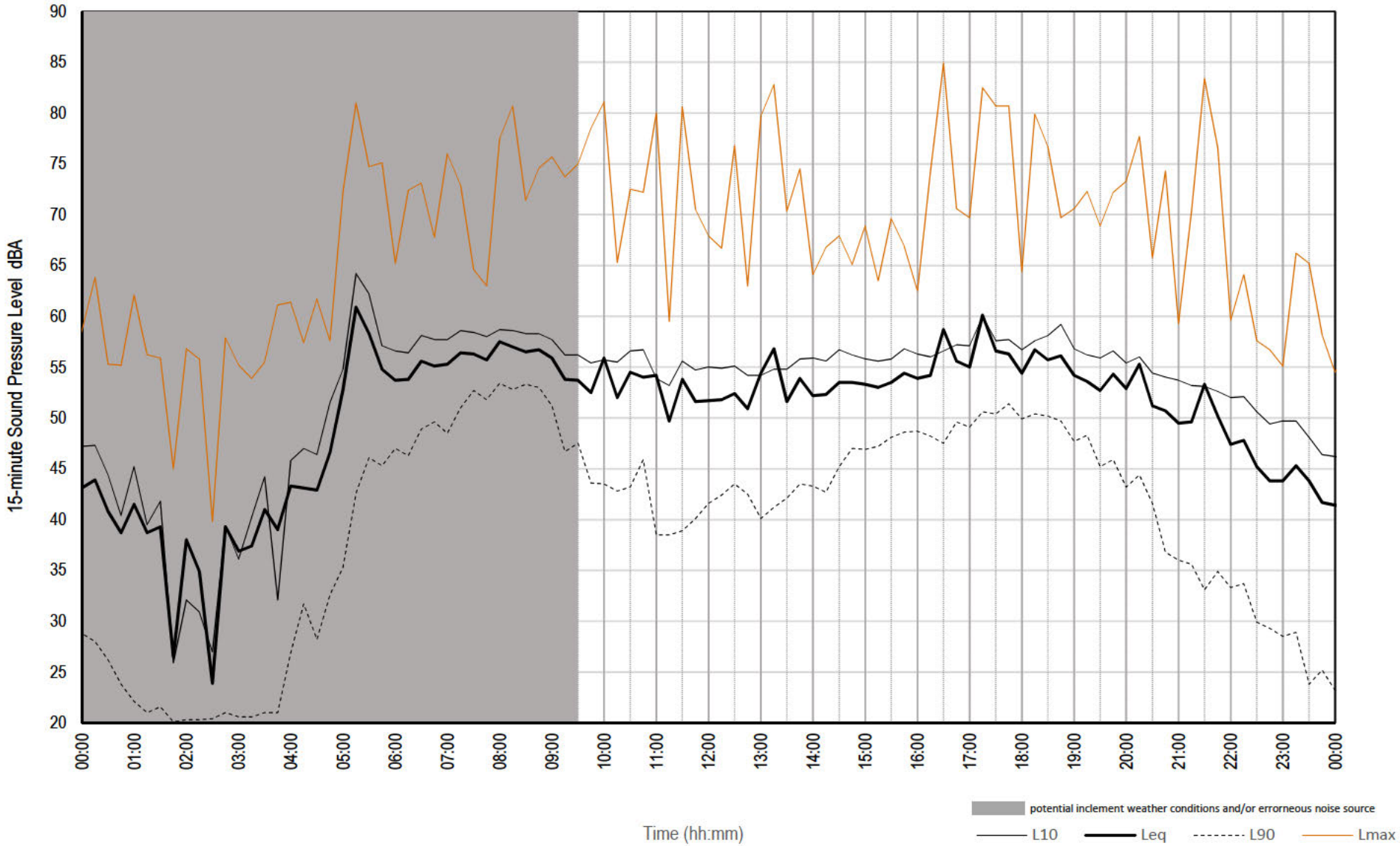
Measured Noise Levels - L3 - 38 Dixson Cct

Tuesday, 24 November 2020



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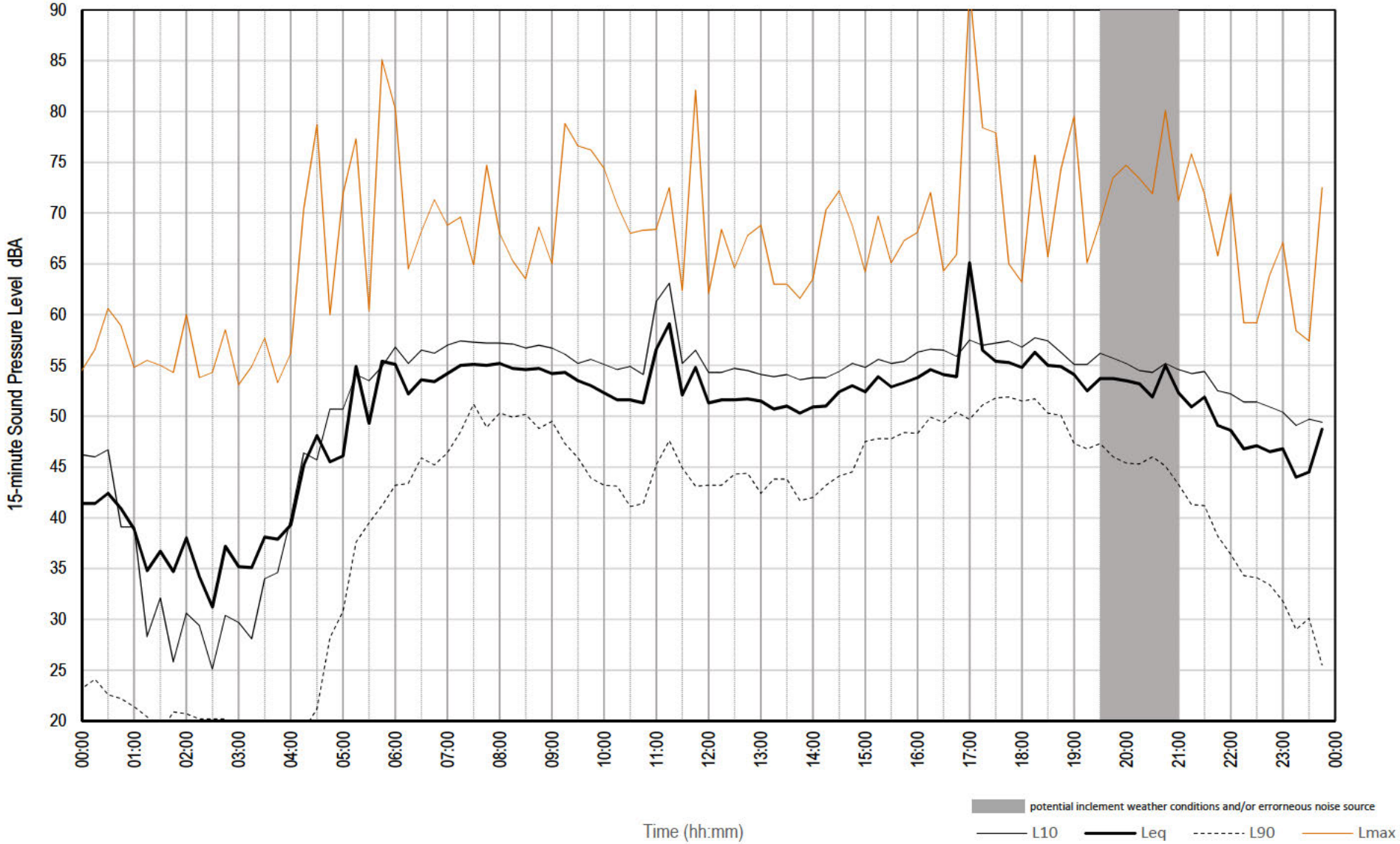
Measured Noise Levels - L3 - 38 Dixson Cct

Wednesday, 25 November 2020



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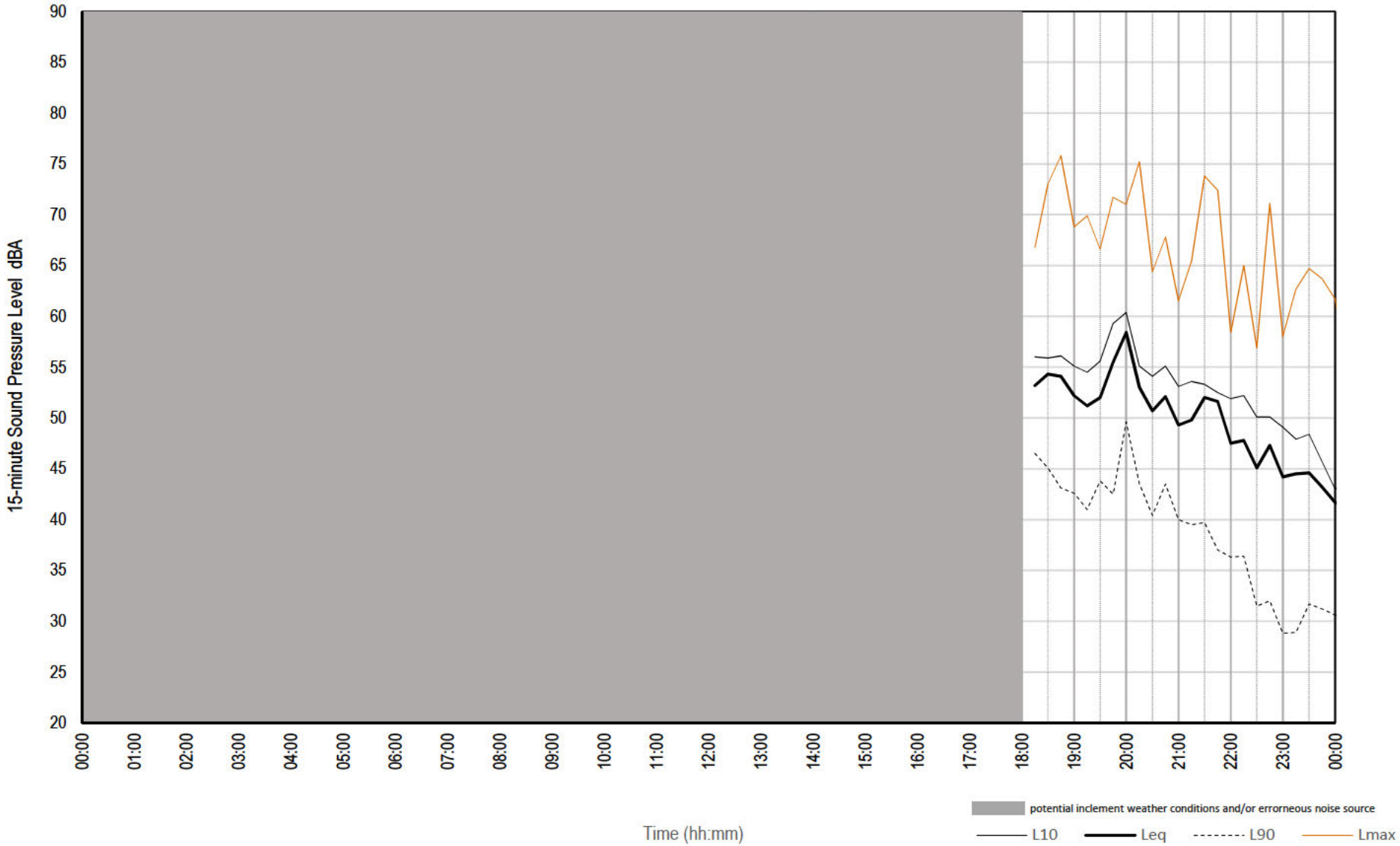
A1.2 NM2

Measured Noise Levels - L2 - 42 House Cct

Tuesday, 03 November 2020



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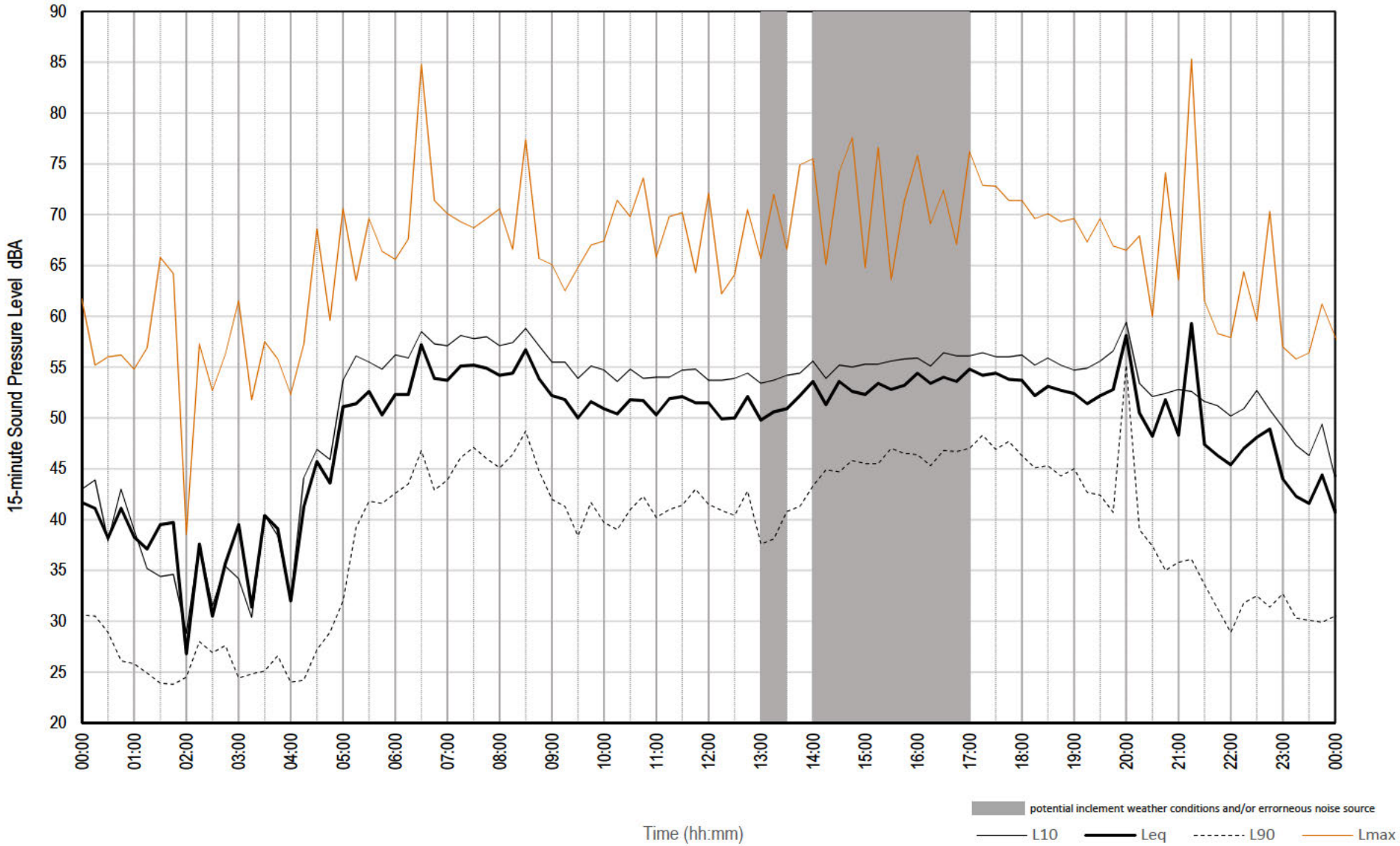
Measured Noise Levels - L2 - 42 House Cct

Wednesday, 04 November 2020



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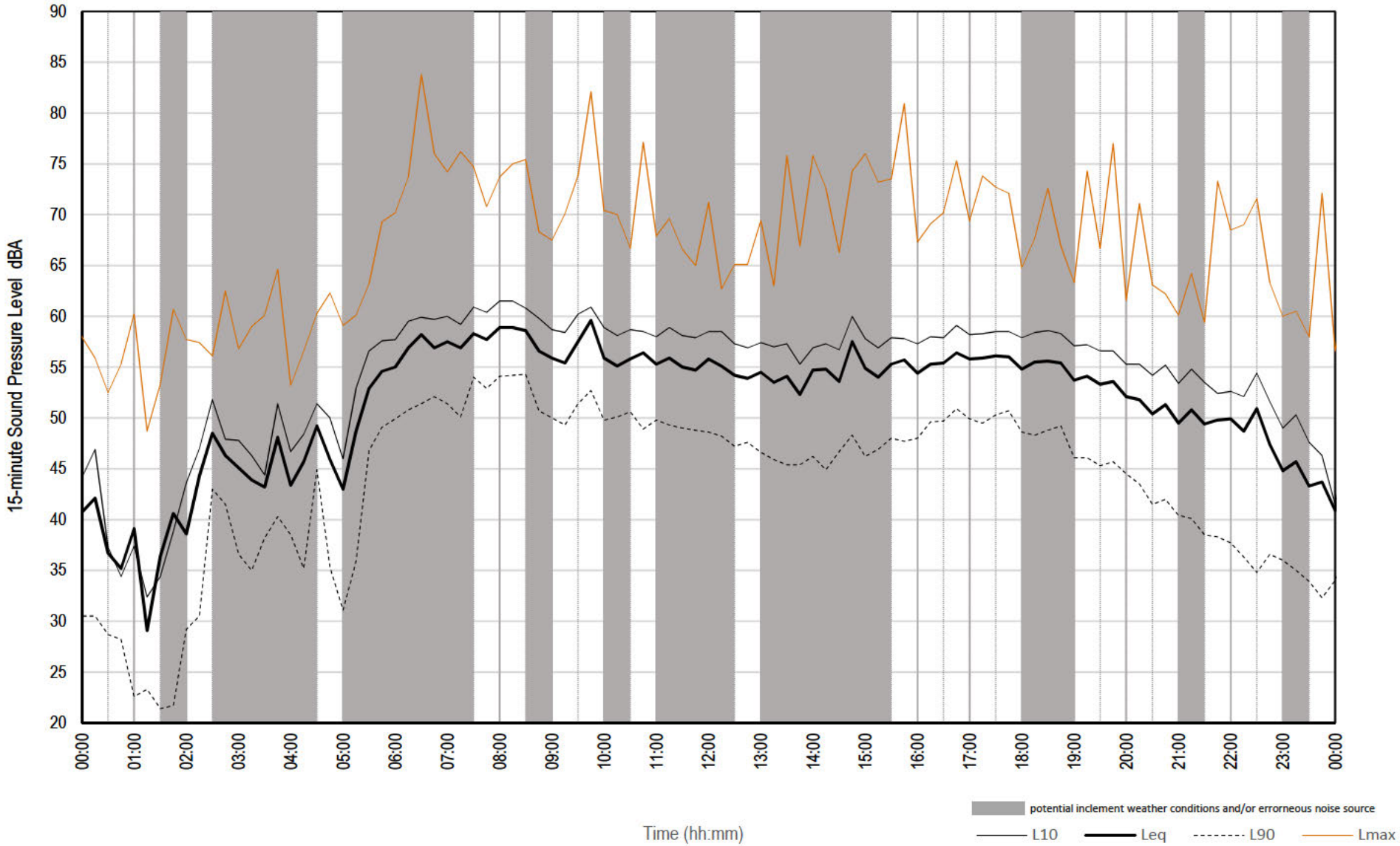
Measured Noise Levels - L2 - 42 House Cct

Thursday, 05 November 2020



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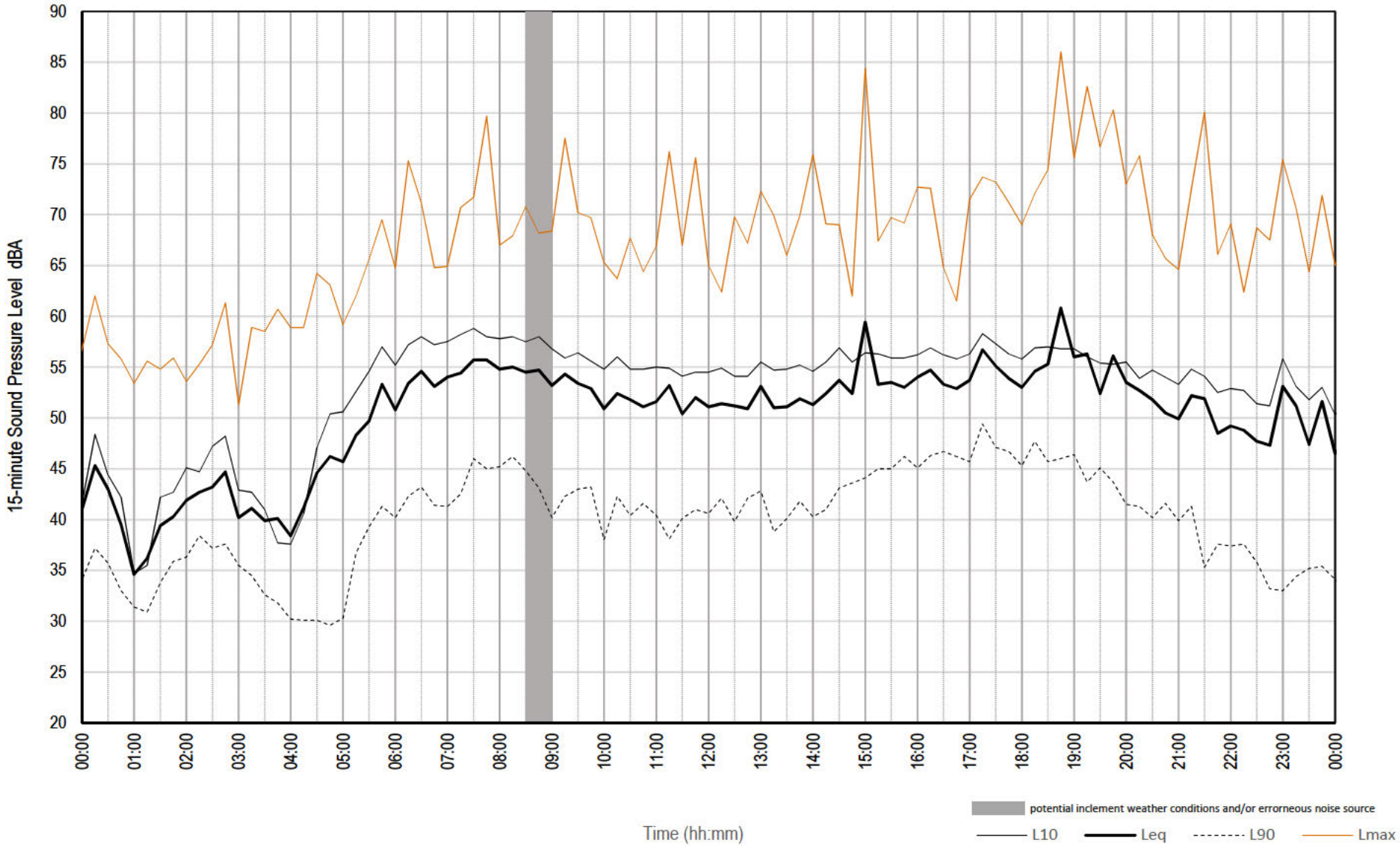
Measured Noise Levels - L2 - 42 House Cct

Friday, 06 November 2020



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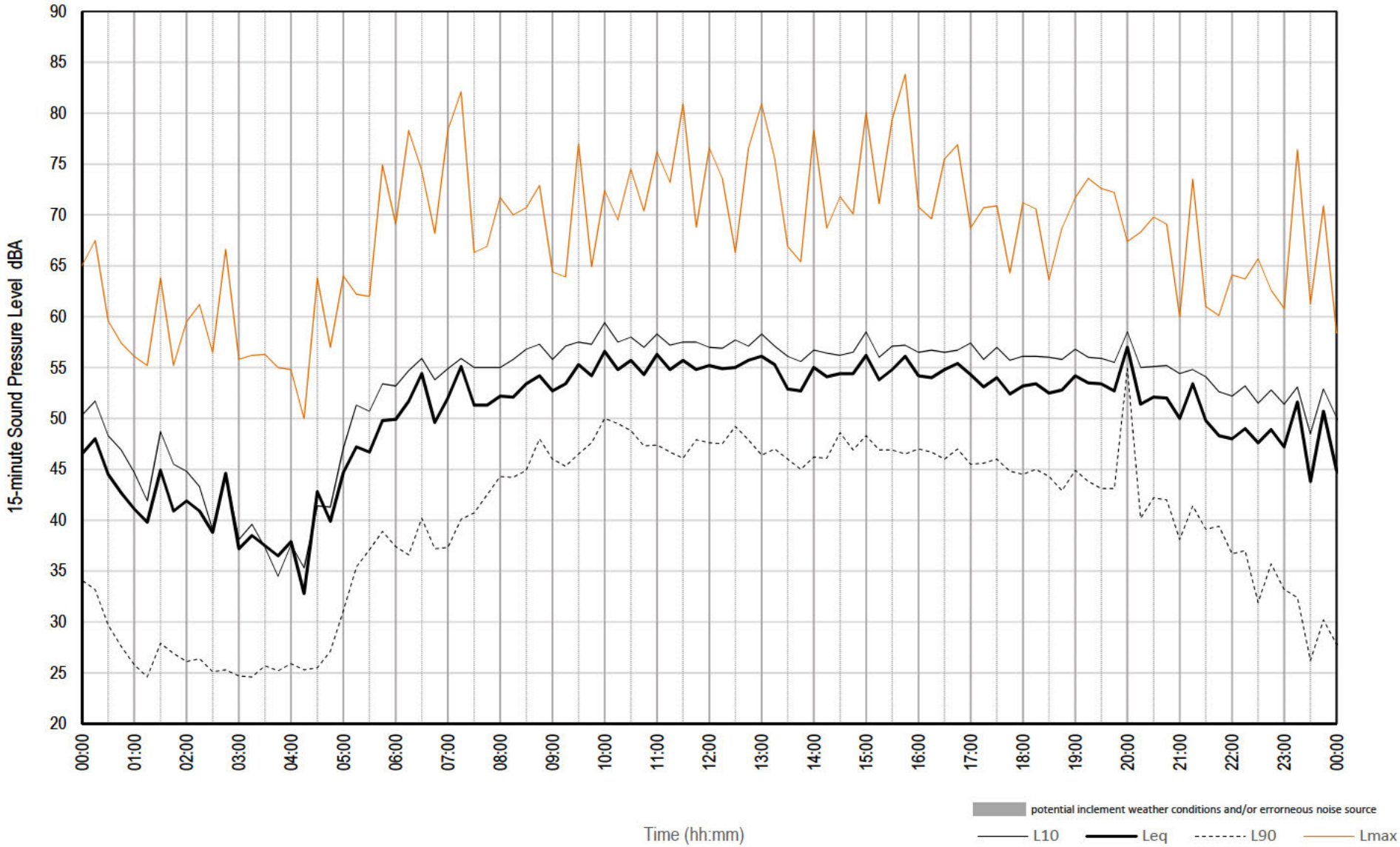
Measured Noise Levels - L2 - 42 House Cct

Saturday, 07 November 2020



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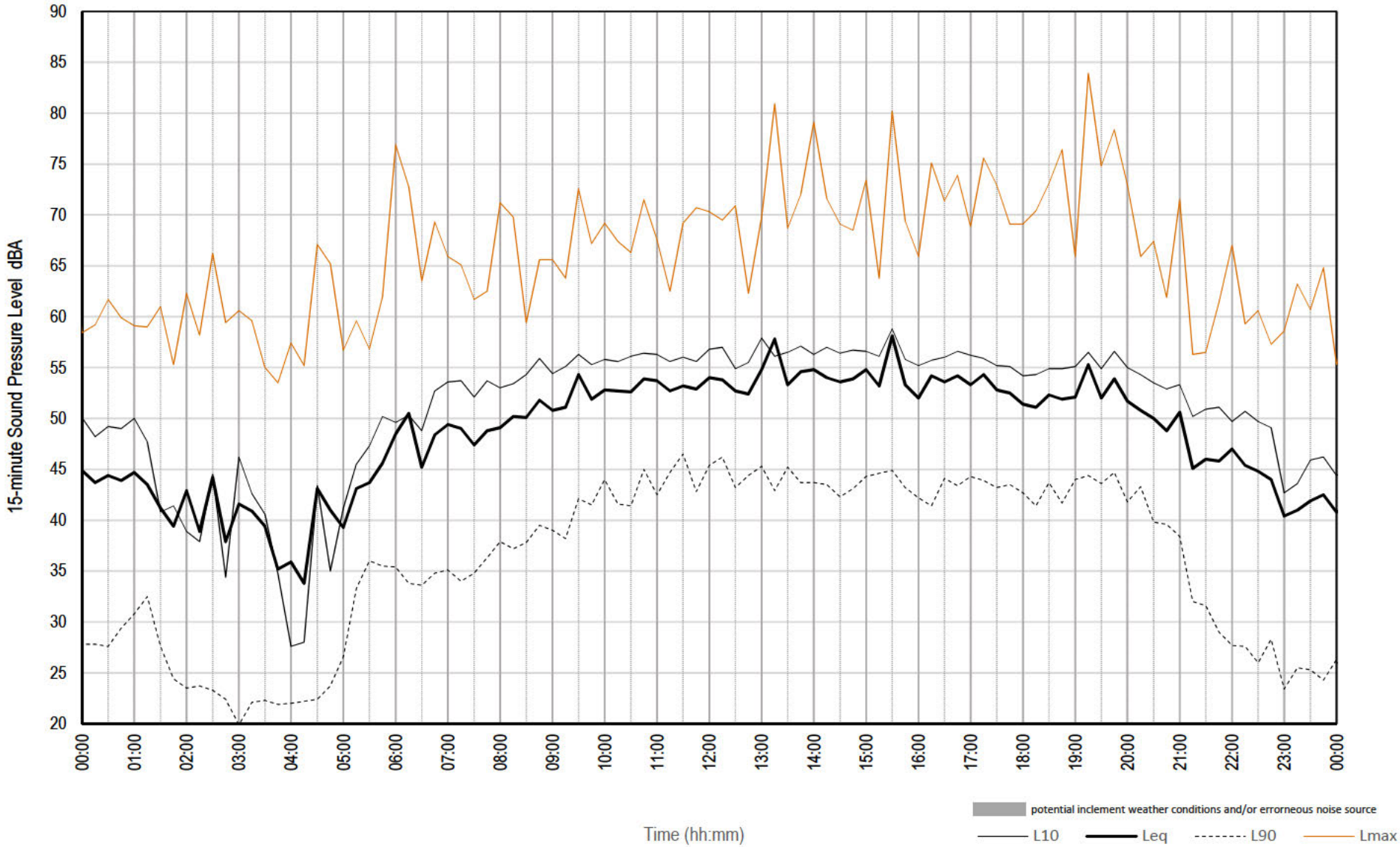
Measured Noise Levels - L2 - 42 House Cct

Sunday, 08 November 2020



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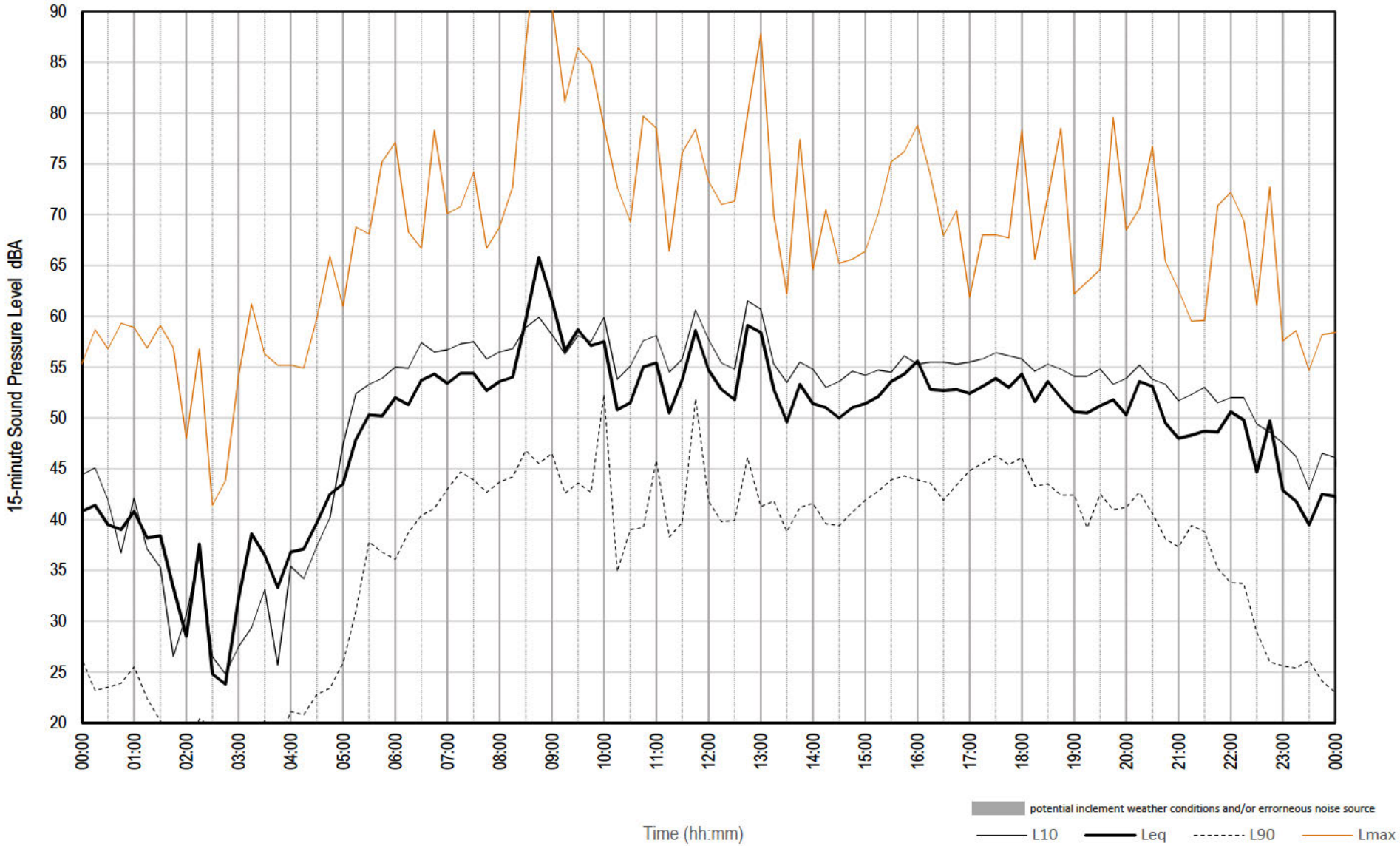
Measured Noise Levels - L2 - 42 House Cct

Monday, 09 November 2020



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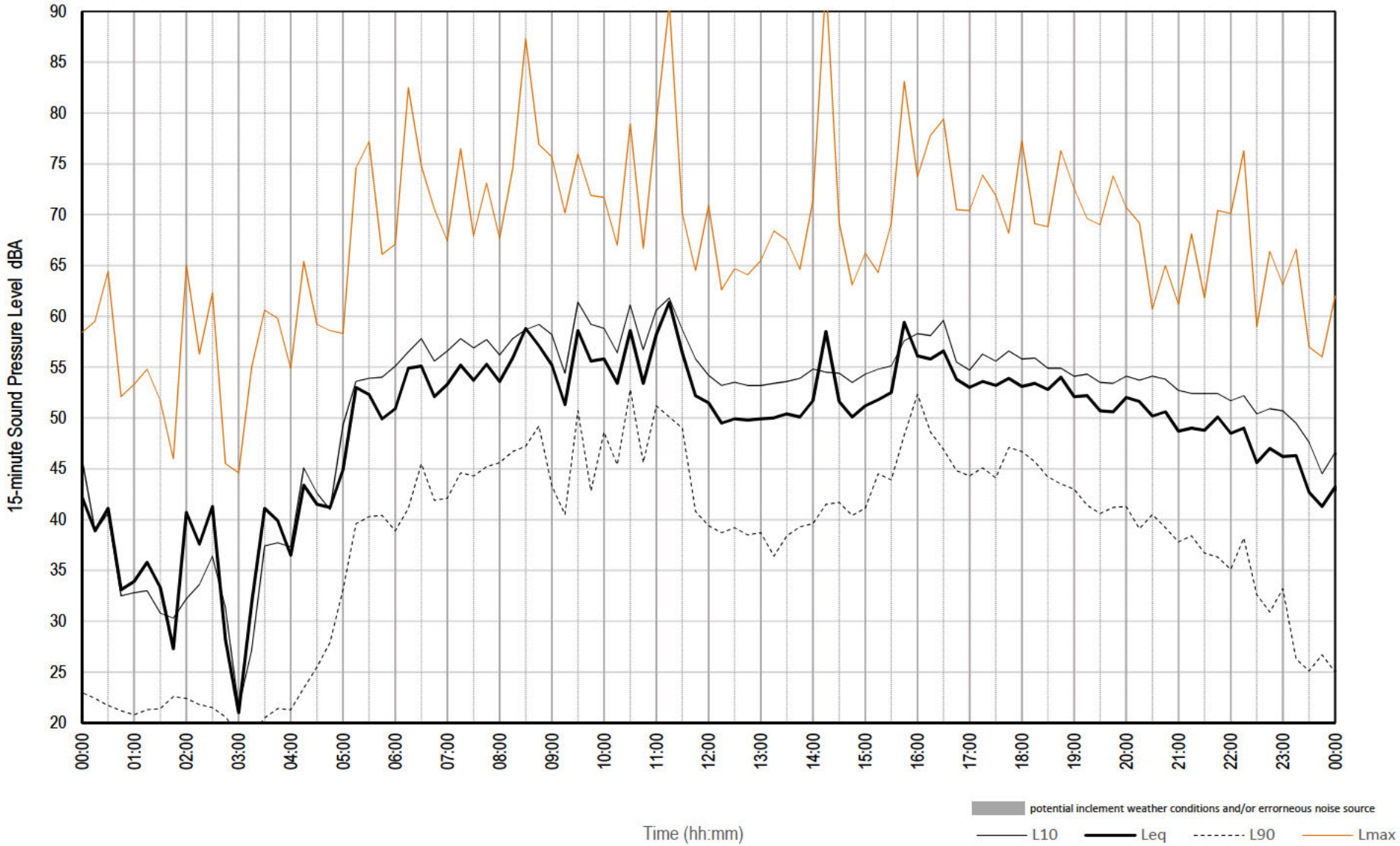
Measured Noise Levels - L2 - 42 House Cct

Tuesday, 10 November 2020



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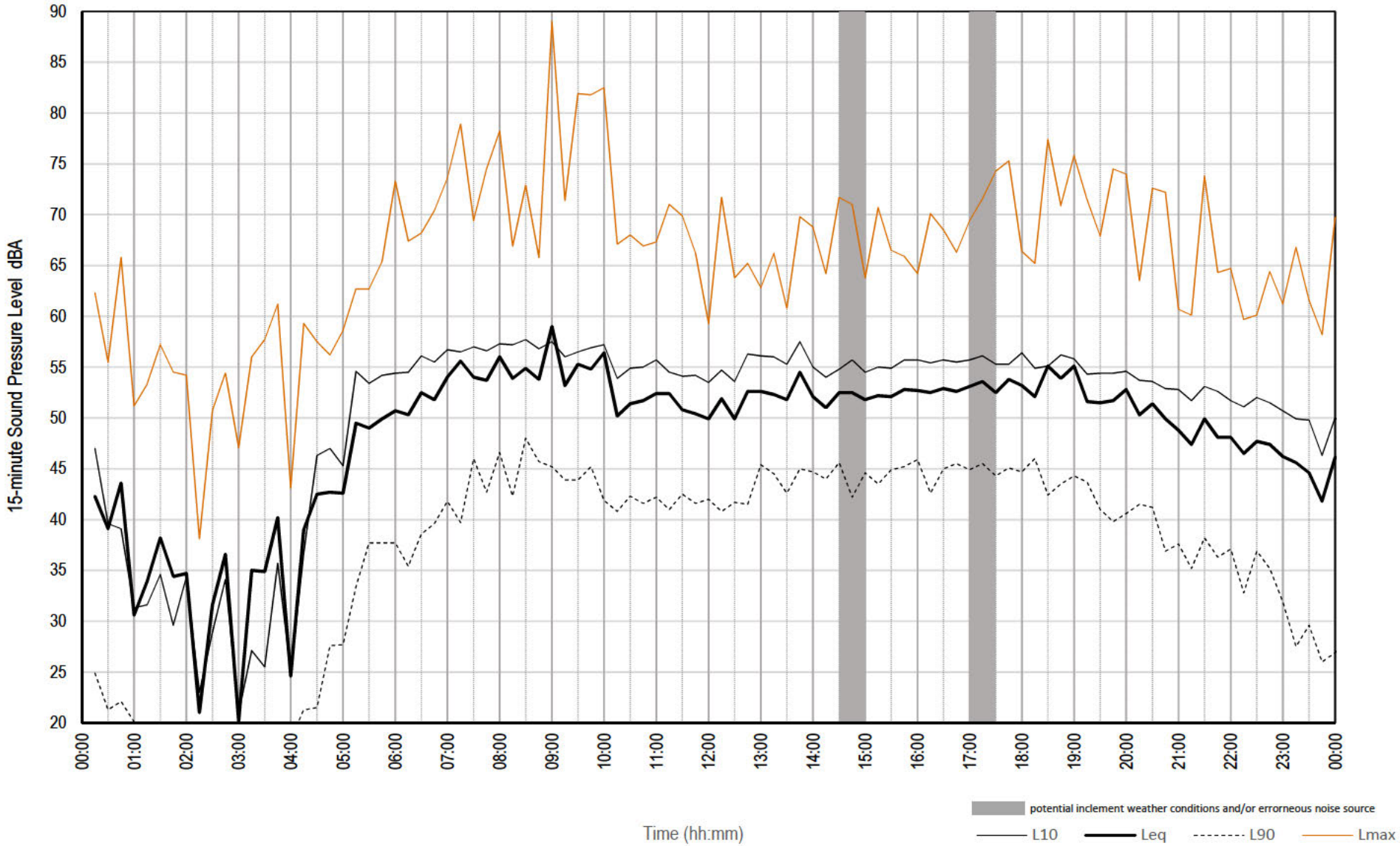
Measured Noise Levels - L1 - 13 Coventry Cl

Friday, 13 November 2020



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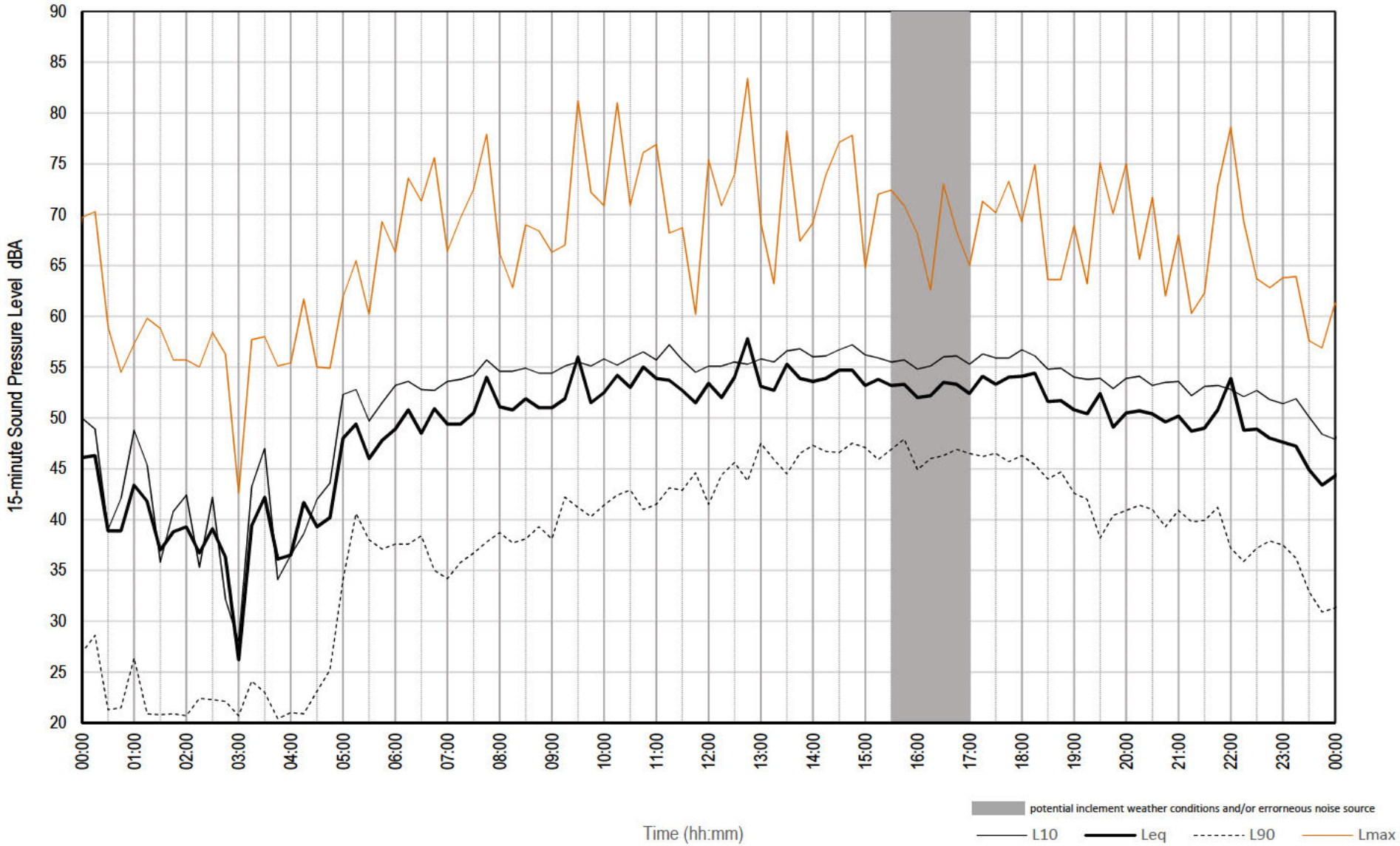
Measured Noise Levels - L1 - 13 Coventry Cl

Saturday, 14 November 2020



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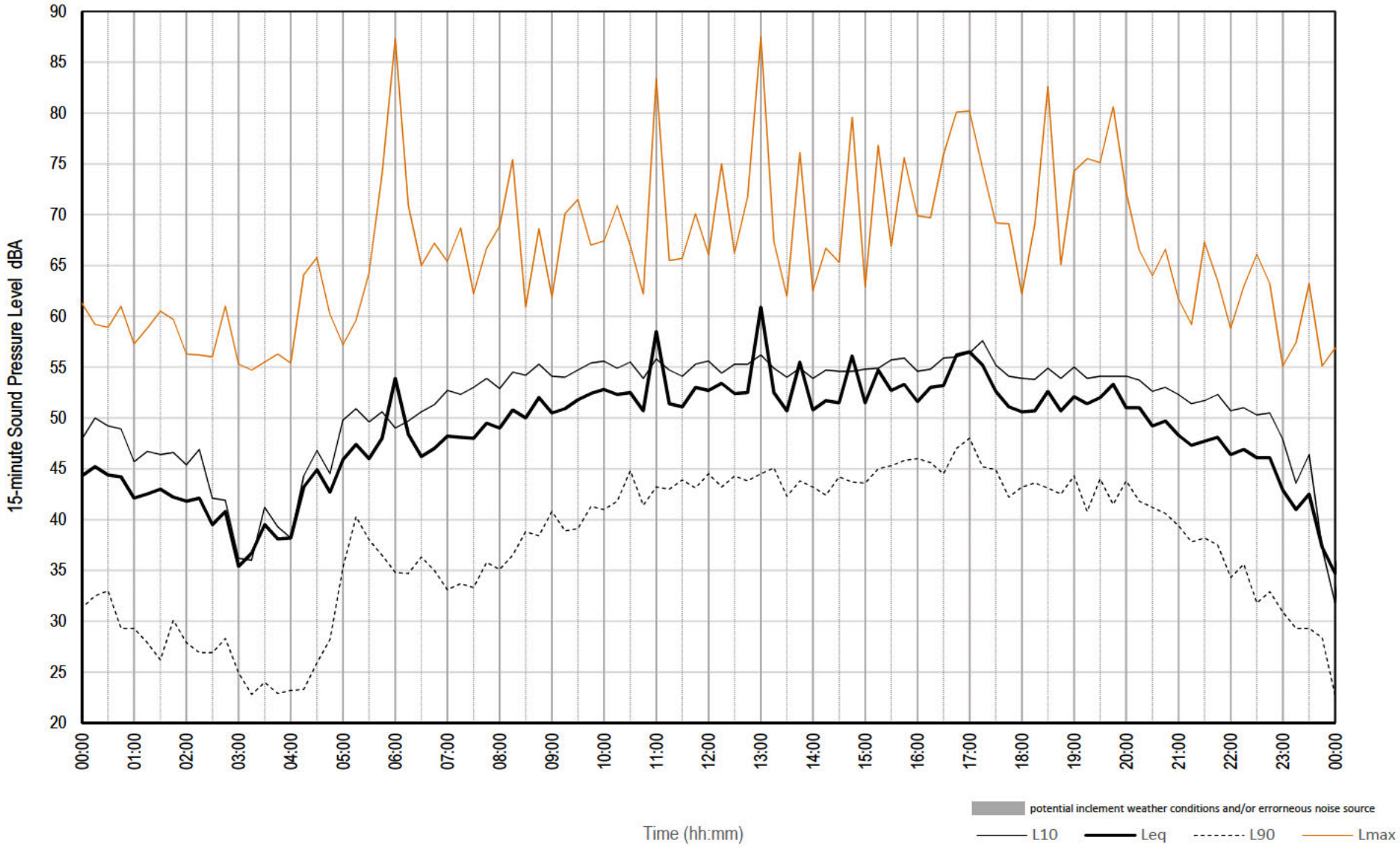
Measured Noise Levels - L1 - 13 Coventry Cl

Sunday, 15 November 2020



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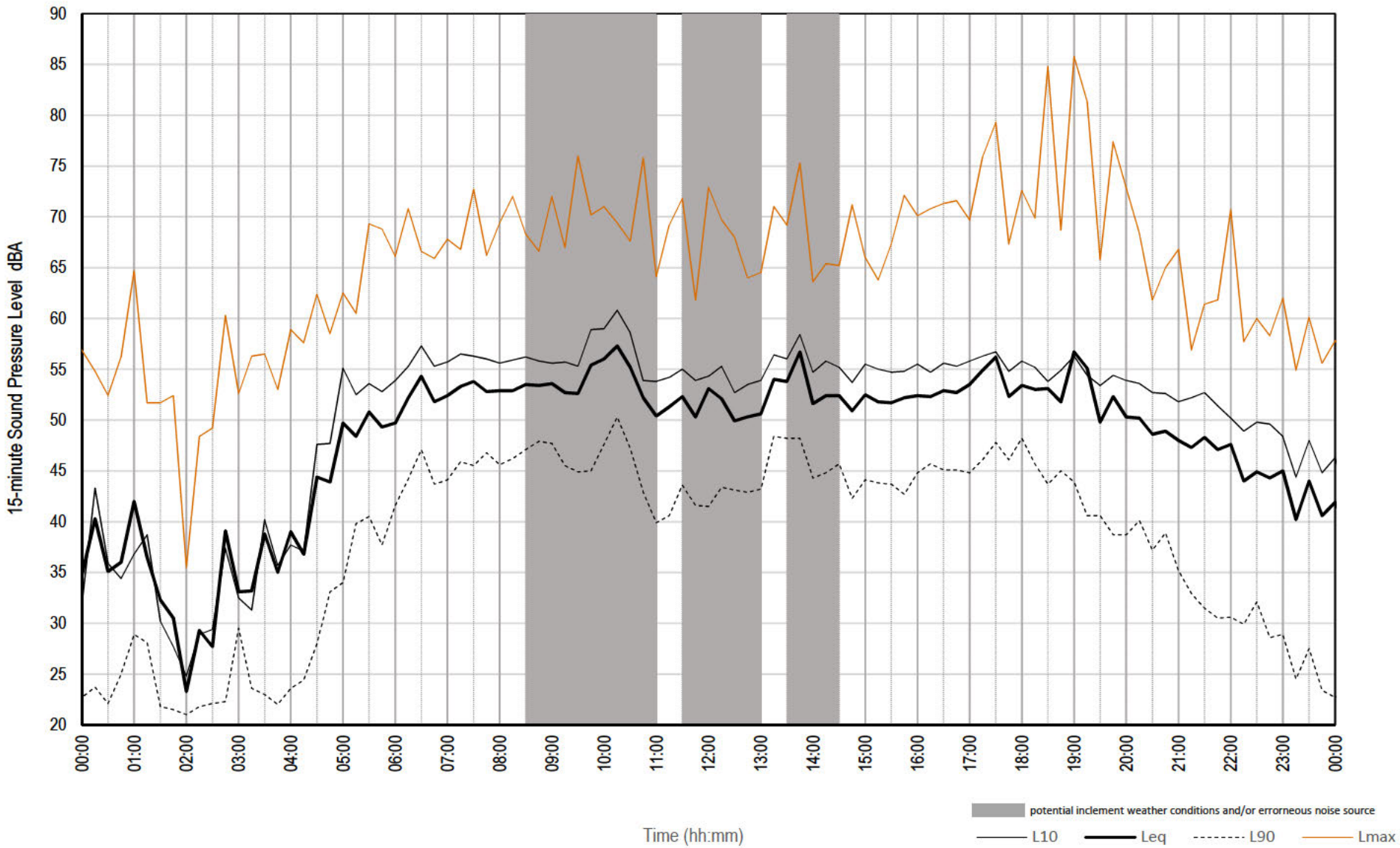

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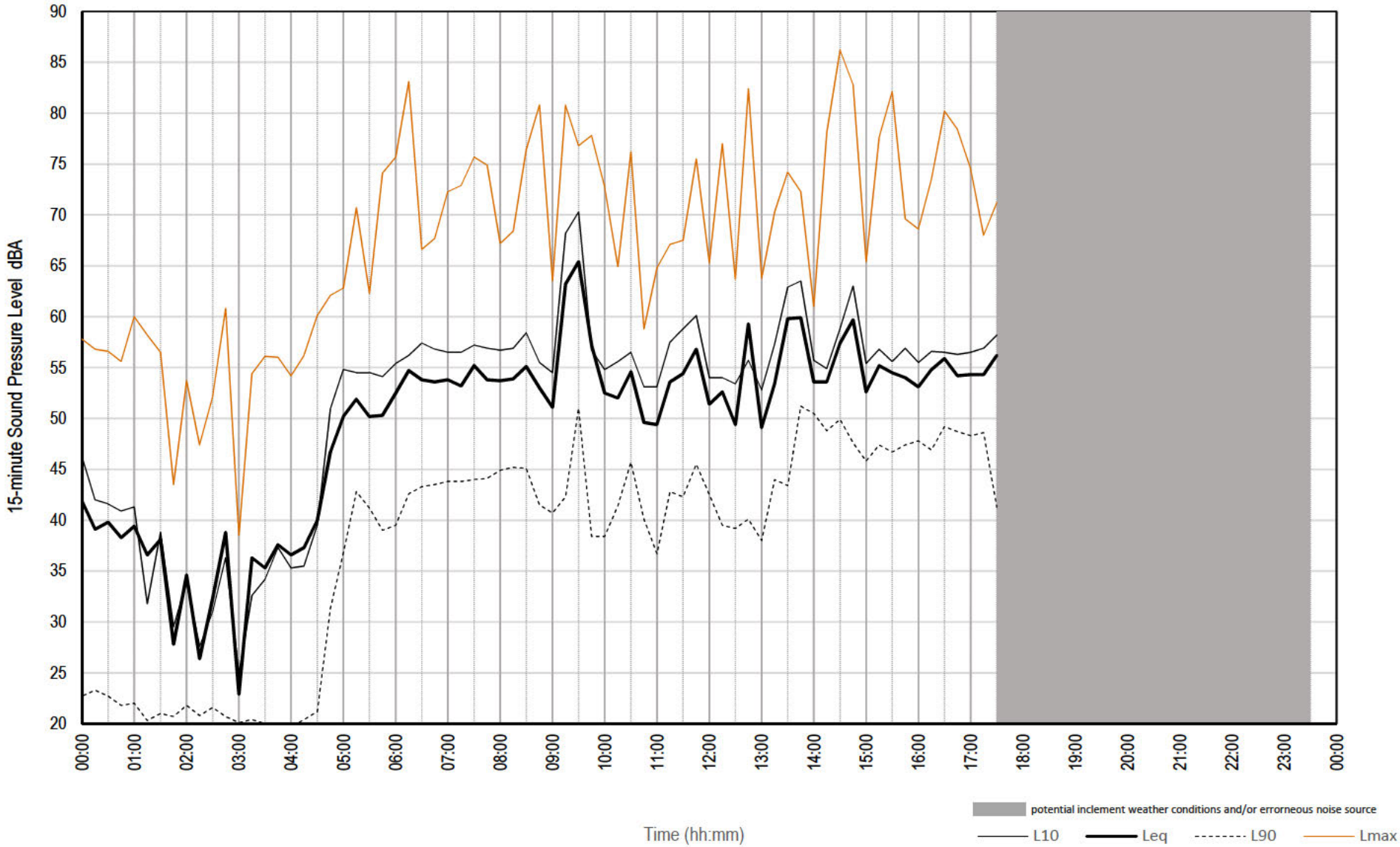
Measured Noise Levels - L1 - 13 Coventry Cl

Tuesday, 17 November 2020



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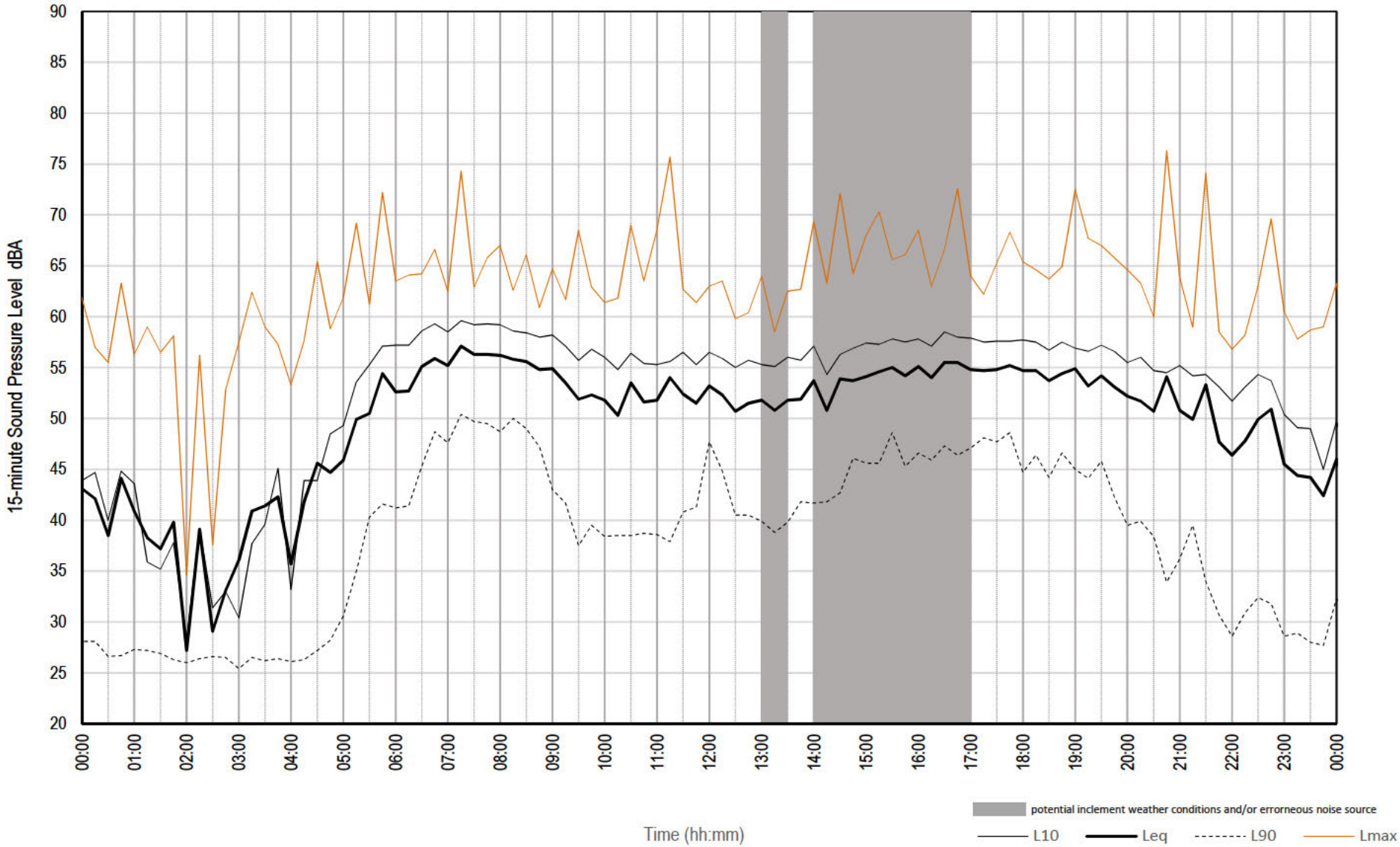
A1.3 NM3

Measured Noise Levels - L2 - 42 House Cct

Wednesday, 04 November 2020



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Measured Noise Levels - L2 - 42 House Cct

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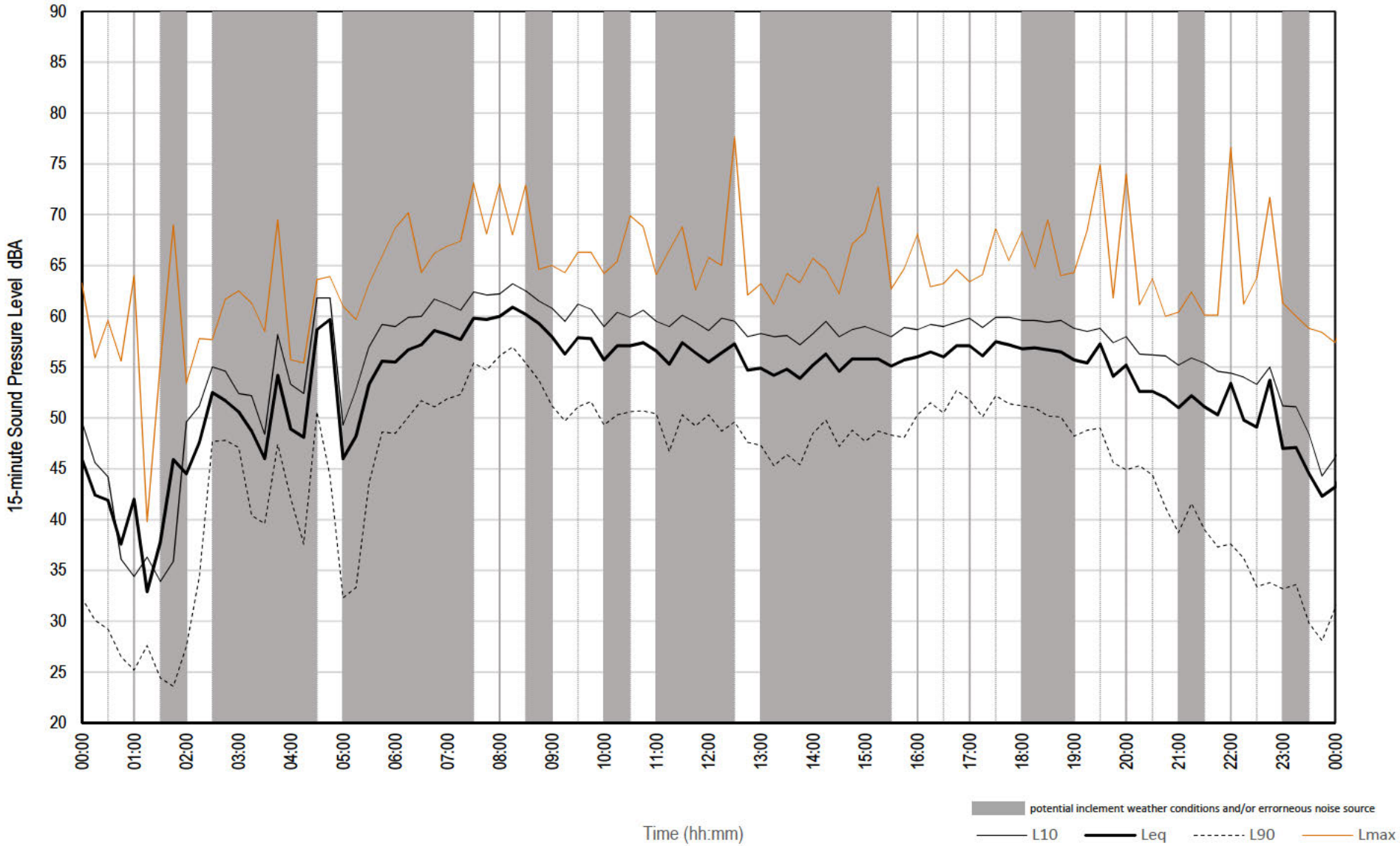

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Measured Noise Levels - L2 - 42 House Cct

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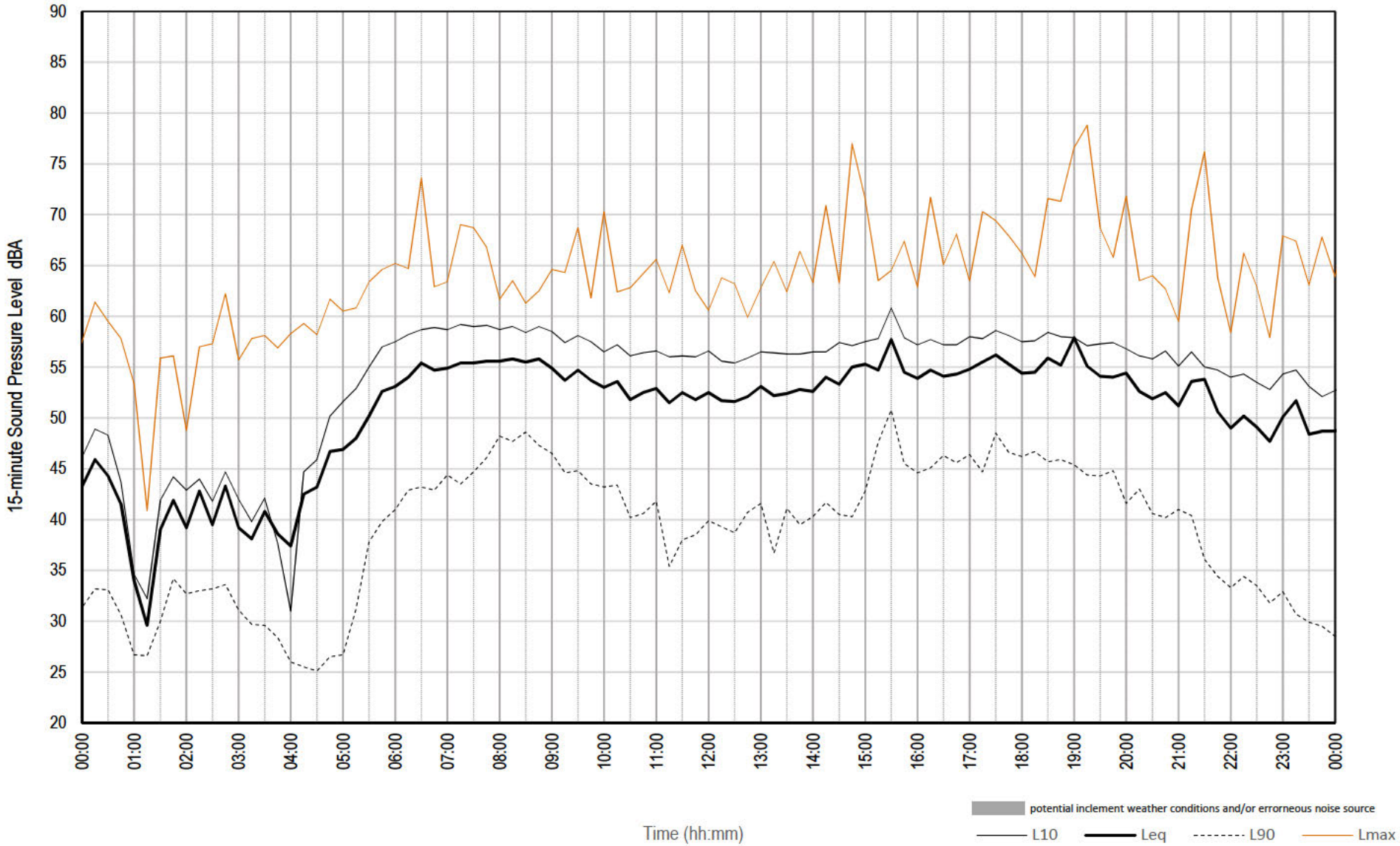

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Measured Noise Levels - L2 - 42 House Cct

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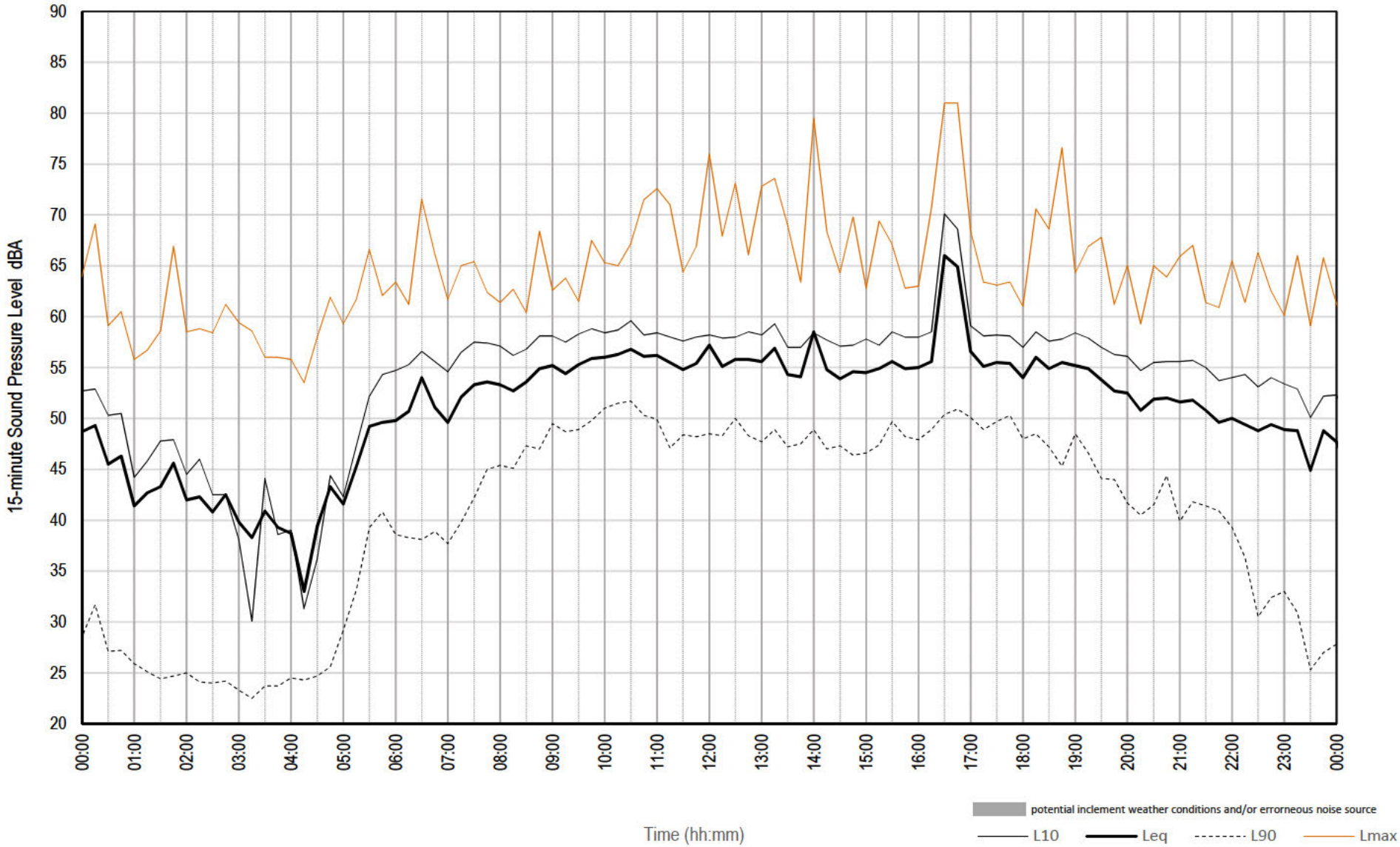

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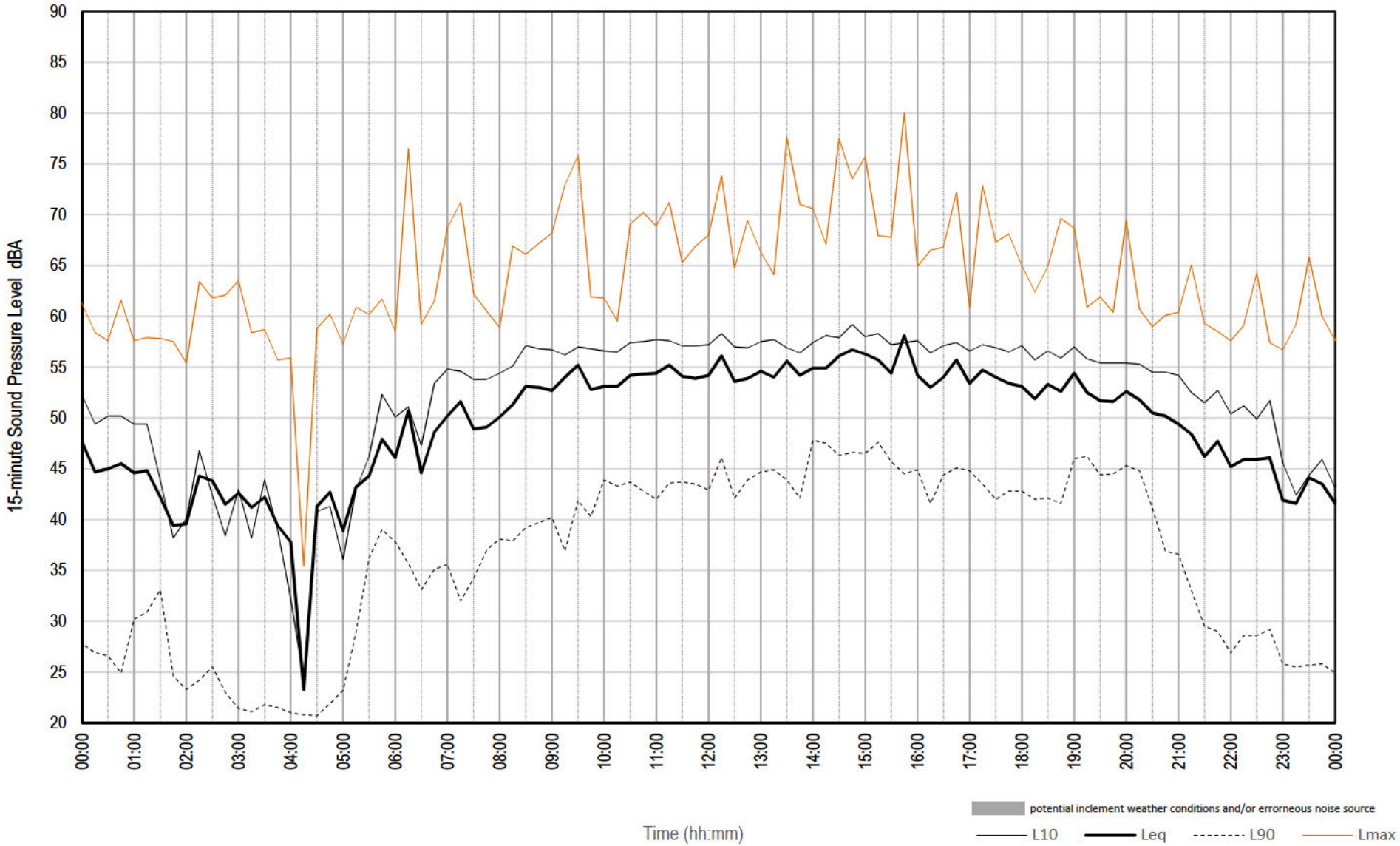
Measured Noise Levels - L2 - 42 House Cct

Sunday, 08 November 2020



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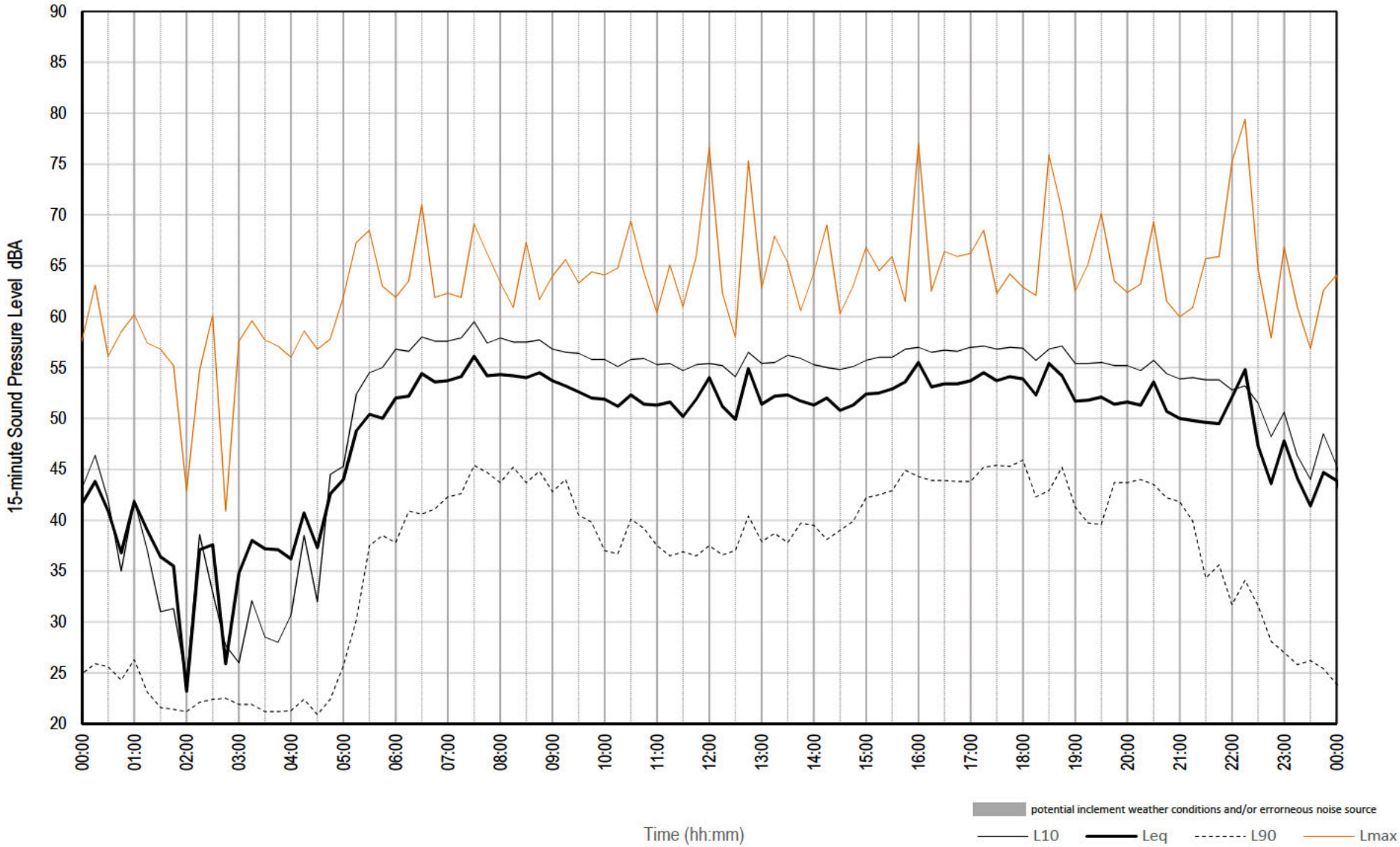
Measured Noise Levels - L2 - 42 House Cct

Monday, 09 November 2020



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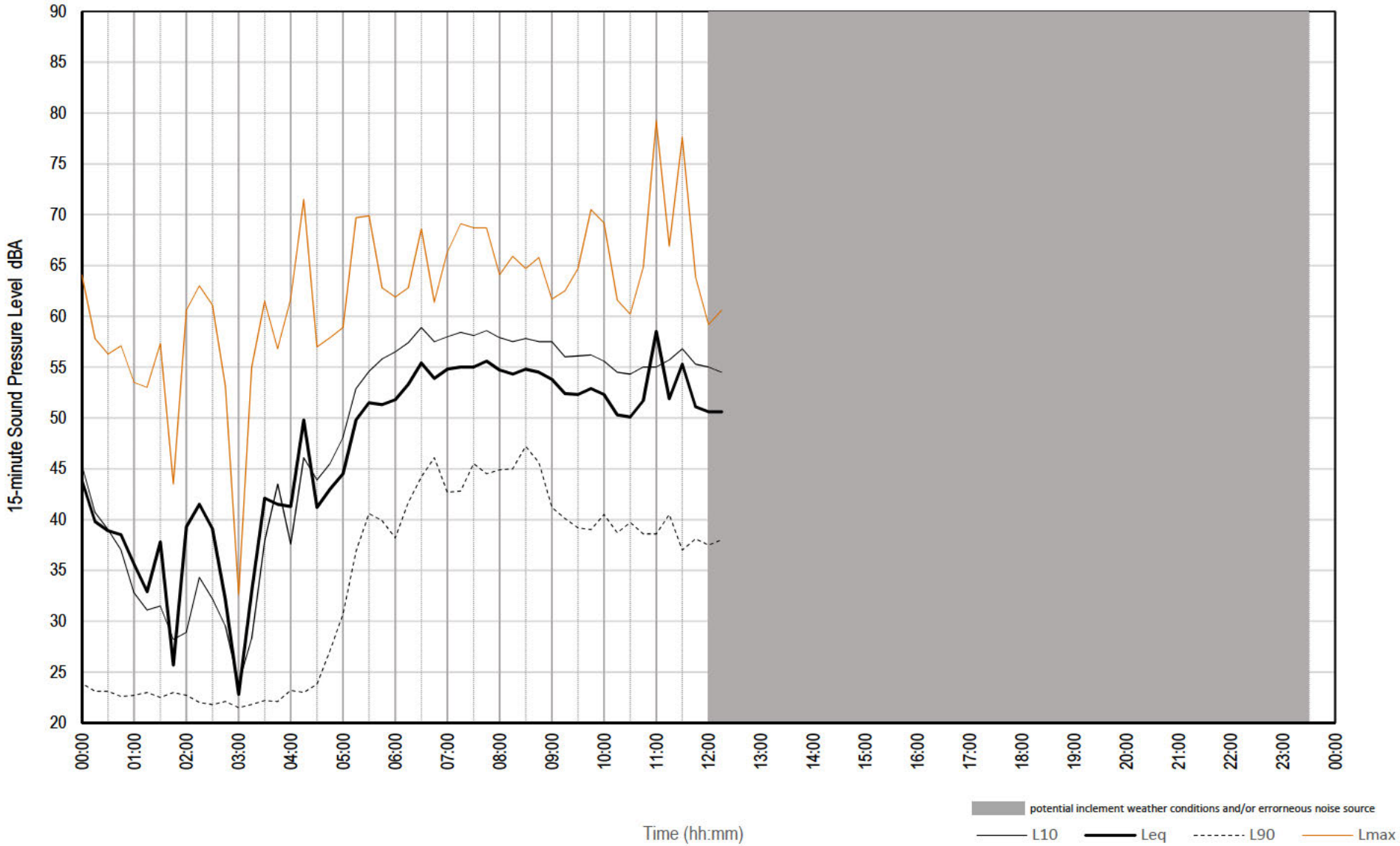
Measured Noise Levels - L2 - 42 House Cct

Tuesday, 10 November 2020



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APPENDIX B

TRAFFIC VOLUME DATA

B1 WEEKLY DATA

B1.1 T1 - THARWA DRIVE SOUTH OF NORMAN LINDSAY ST

DIRECTION	PERIOD	VOLUMES		%HV	TOTAL	MEAN SPEED (KM/H)	85TH PERCENTILE SPEED (KM/H)
		LIGHT VEHICLES	HEAVY VEHICLES				
Week 1 - Thursday, November 5, 2020 to Thursday, November 12, 2020							
Northbound	15 hour vol	5843	267	4%	6110	69	76
	9 hour vol	771	60	7%	831	72	79
Southbound	15 hour vol	6296	261	4%	6557	70	77
	9 hour vol	386	13	3%	399	72	80
Week 2 - Thursday, November 12, 2020 to Thursday, November 19, 2020							
Northbound	15 hour vol	5767	251	4%	6018	69	77
	9 hour vol	786	51	6%	837	71	79
Southbound	15 hour vol	6255	260	4%	6515	70	77
	9 hour vol	378	10	3%	388	71	79
Week 3 - Thursday, November 19, 2020 to Thursday, November 26, 2020							
Northbound	15 hour vol	5786	234	4%	6020	70	77
	9 hour vol	779	53	6%	832	71	79
Southbound	15 hour vol	6216	265	4%	6481	70	77
	9 hour vol	379	11	3%	390	71	80

B1.2 T2 – THARWA DRIVE NORTH OF POCKETT AVE

DIRECTION	PERIOD	VOLUMES		%HV	TOTAL	MEAN SPEED (KM/H)	85TH PERCENTILE SPEED (KM/H)
		LIGHT VEHICLES	HEAVY VEHICLES				
Week 1 - Thursday, November 5, 2020 to Thursday, November 12, 2020							
Northbound	15 hour vol	3178	139	4%	3317	70	77
	9 hour vol	410	27	6%	437	70	77
Southbound	15 hour vol	3479	171	5%	3650	71	77
	9 hour vol	225	11	5%	236	70	77
Week 2 - Thursday, November 12, 2020 to Thursday, November 19, 2020							
Northbound	15 hour vol	3116	131	4%	3247	70	77
	9 hour vol	413	25	6%	438	70	77
Southbound	15 hour vol	3454	155	4%	3609	71	77
	9 hour vol	211	5	2%	216	71	77
Week 3 - Thursday, November 19, 2020 to Thursday, November 26, 2020							
Northbound	15 hour vol	3106	134	4%	3240	70	77
	9 hour vol	413	28	6%	441	70	78
Southbound	15 hour vol	3431	154	4%	3585	72	77
	9 hour vol	214	7	3%	221	70	77

Appendix G Drawings

THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTIONS STUDY

LOCALITY PLAN

SCALE

0 60 120 180 240 300 360 420 480

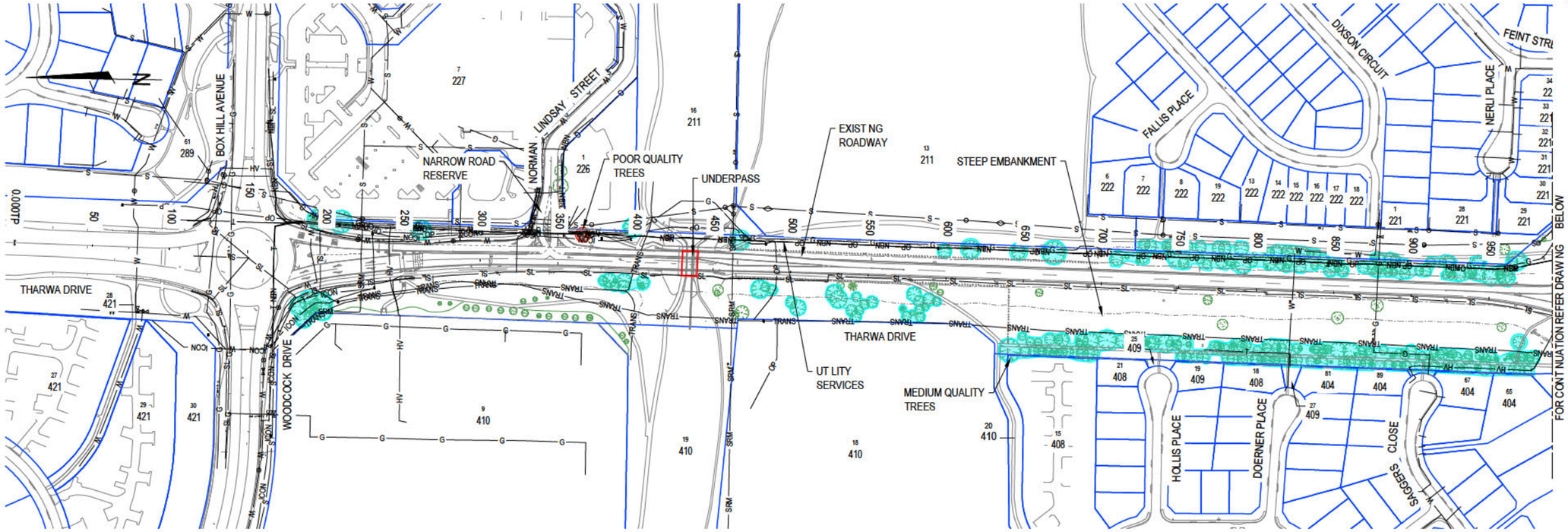
SCALE 1:6000 (A1) SCALE 1:12000 (A3)

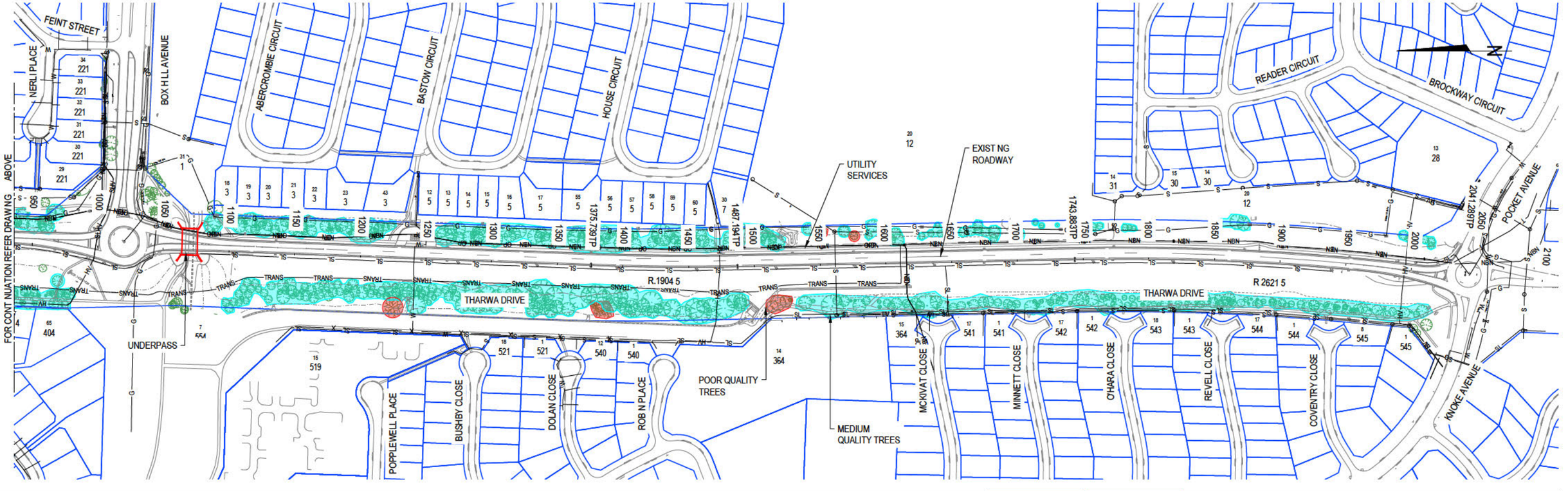
DRAWING SCHEDULE		
DWG NO.	SHEET TITLE	SHEET NO OF NO
000	COVER SHEET	.
006	CONSTRA NTS PLAN	.
011	TYPICAL CROSS SECTIONS	.
100	DESIGN OPTIONS STUDY LAYOUT PLAN	.
101	DESIGN OPTION AREA 1 - OPTION 1	.
102	DESIGN OPTION AREA 1 - OPTION 2	.
103	DESIGN OPTION AREA 2	.
104	DESIGN OPTION AREA 3	.
105	DESIGN OPTION AREA 4	.
106	DESIGN OPTION AREA 5	.
107	DESIGN OPTION AREA 6	.
108	DESIGN OPTION AREA 7	SHEET 1 OF 2
109	DESIGN OPTION AREA 7	SHEET 2 OF 2
110	DESIGN OPTION AREA 8 - OPTION 1	.
111	DESIGN OPTION AREA 8 - OPTION 2	.
112	DESIGN OPTION AREA 8 - OPTION 3	.
150	PREFERRED OPTION PLAN	.
301	LONGITUDINAL SECTIONS	SHEET 1 OF 2
302	LONGITUDINAL SECTIONS	SHEET 2 OF 2

FILE: H:\2020-000580\06_MODEL\CIVIL3D\DESIGN\OPTION\20-000580-000.DWG LAST SAVED

THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

Project No.:	Milestone:	Drawing No.:	Revision:
20-000580	DESIGN OPTIONS STUDY	000	FI





LEGEND:

- BLOCK BOUNDARY
- EXIST NG STRUCTURE
- X — ABANDONED SERVICE
- NBN — EXIST NG NBN
- OP — EXIST NG OPTUS
- TRANS — EXIST NG TRANS ACT
- T — EXIST NG TELSTRA
- ICON — EXIST NG ICON
- HV — EXIST NG HIGH VOLTAGE ELECTRICITY
- LV — EXIST NG LOW VOLTAGE ELECTRICITY
- SL — EXIST NG STREETLIGHT ELECTRICITY
- G — EXIST NG GAS
- S — EXIST NG SEWER
- SRM — EXIST NG SEWER RISING MA N
- W — EXIST NG WATER
- LOW QUALITY TREES
- MEDIUM QUALITY TREES

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
AMENDMENTS					15/02/2021

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 150 300 450 600 750 900 1050 1200
SCALE 1:1500 (A1) SCALE 1:3000 (A3)

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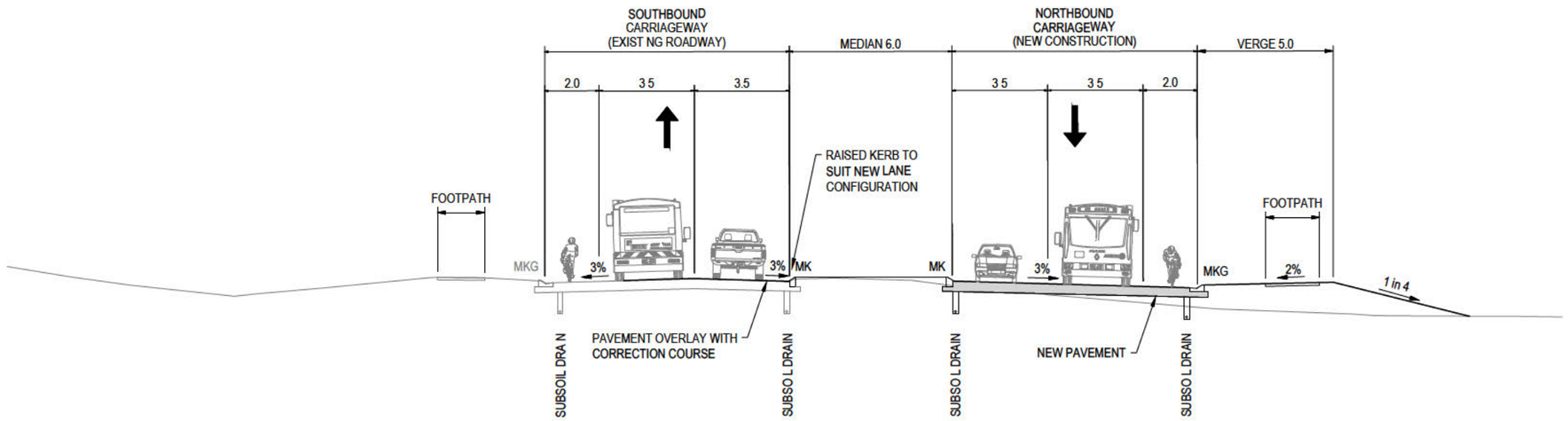
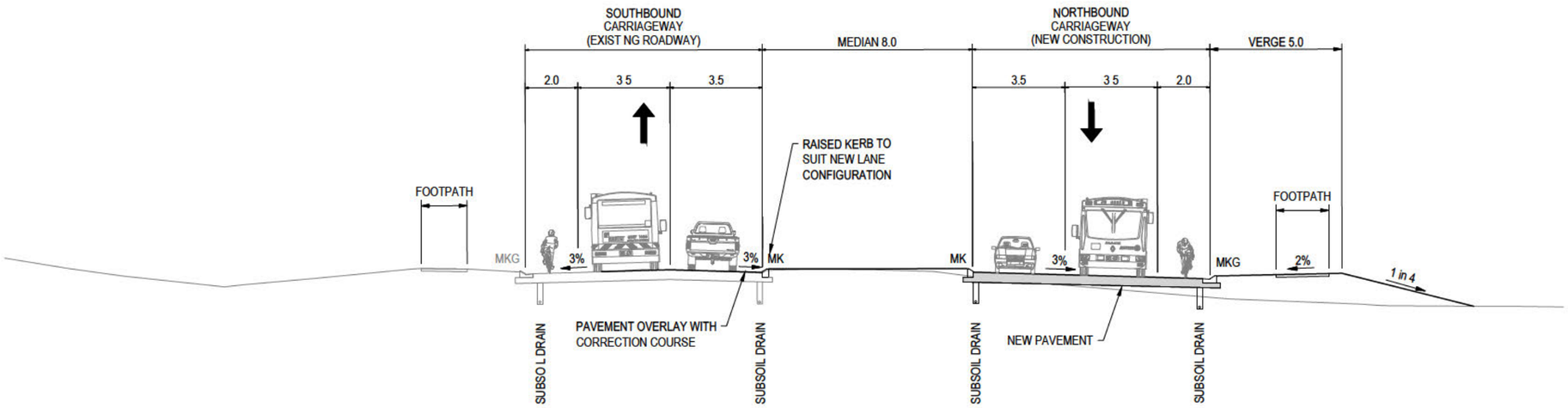
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

CONSTRAINTS PLAN

20-000580 006 —



THARWA DRIVE TYPICAL SECTION
6m MEDIAN
(LOOK NG SOUTH)
SCALE 1:100



THARWA DRIVE TYPICAL SECTION
8m MEDIAN
(LOOKING SOUTH)
SCALE 1:100

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 1 2 3 4 5 6 7 8
SCALE 1:100 (A1) SCALE 1:200 (A3)

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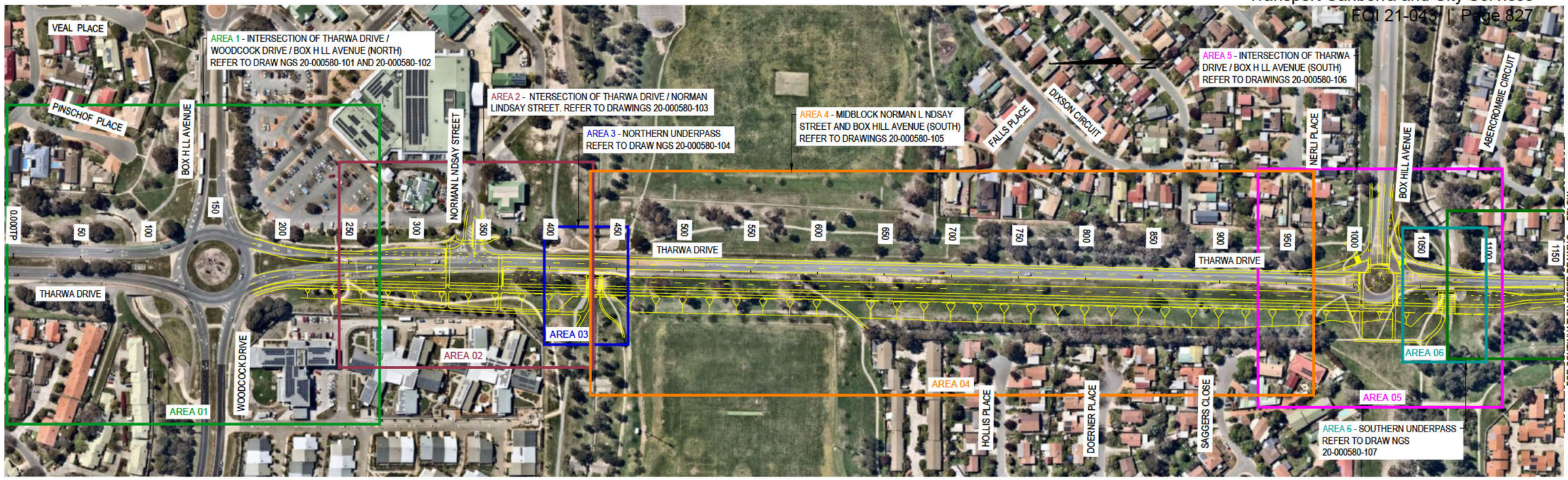
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

TYPICAL CROSS SECTIONS
.
20-000580 011 —



FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS

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DESIGN OPTIONS STUDY

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SCALE 1:1500 (A1) SCALE 1:3000 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTIONS STUDY LAYOUT PLAN

20-000580 100 —

OPTION 1 - DO NOTHING

FIRST ISSUE	DESIGN [redacted]	DRAWN	CHKD	APPROVED	DATE 15/02/2021	AMENDMENT DETAILS	DESIGN OPTIONS STUDY
AMENDMENTS							

0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 1 - OPTION 1

20-000580 101 —

OPTION 2 - TRAFFIC SIGNALS

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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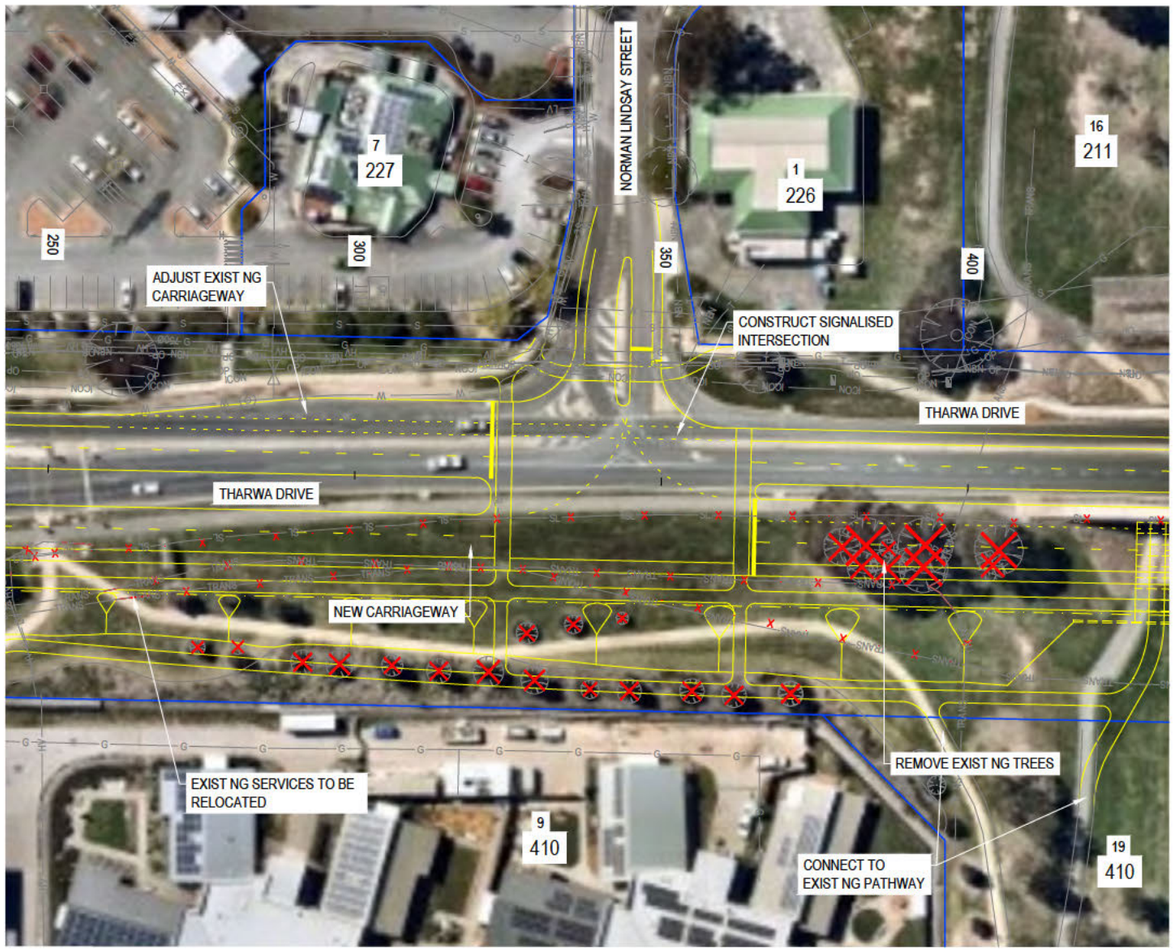
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 1 - OPTION 2

20-000580 102 —

OPTION 1 - LARGE ROUNDABOUT



OPTION 2
TRAFFIC SIGNALS AND REMOVAL OF MIDBLOCK SIGNALISED STAGED PEDESTRIAN CROSSING

FIRST ISSUE / AMENDMENTS — DESIGN [redacted] DRAWN CHECK APPROVED DATE 15/02/2021 — AMENDMENT DETAILS	DESIGN OPTIONS STUDY	0 5 10 15 20 25 30 35 40 SCALE 1:500 (A1) SCALE 1:1000 (A3)	WAE No. — ACT Government
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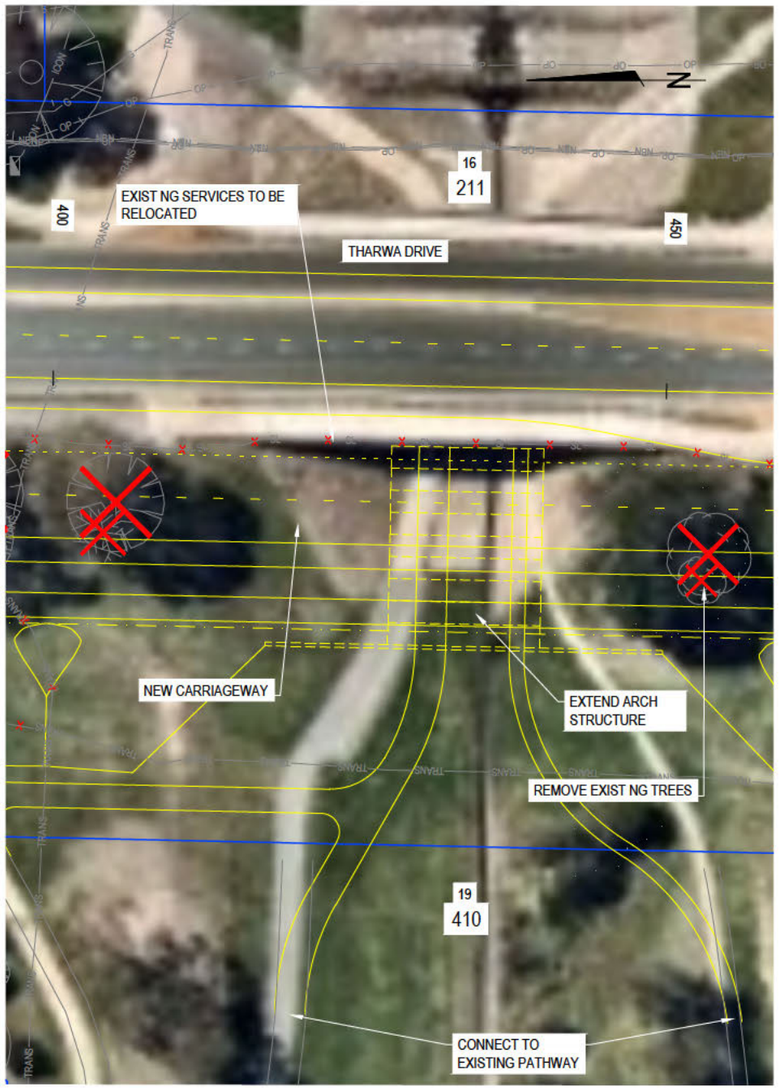
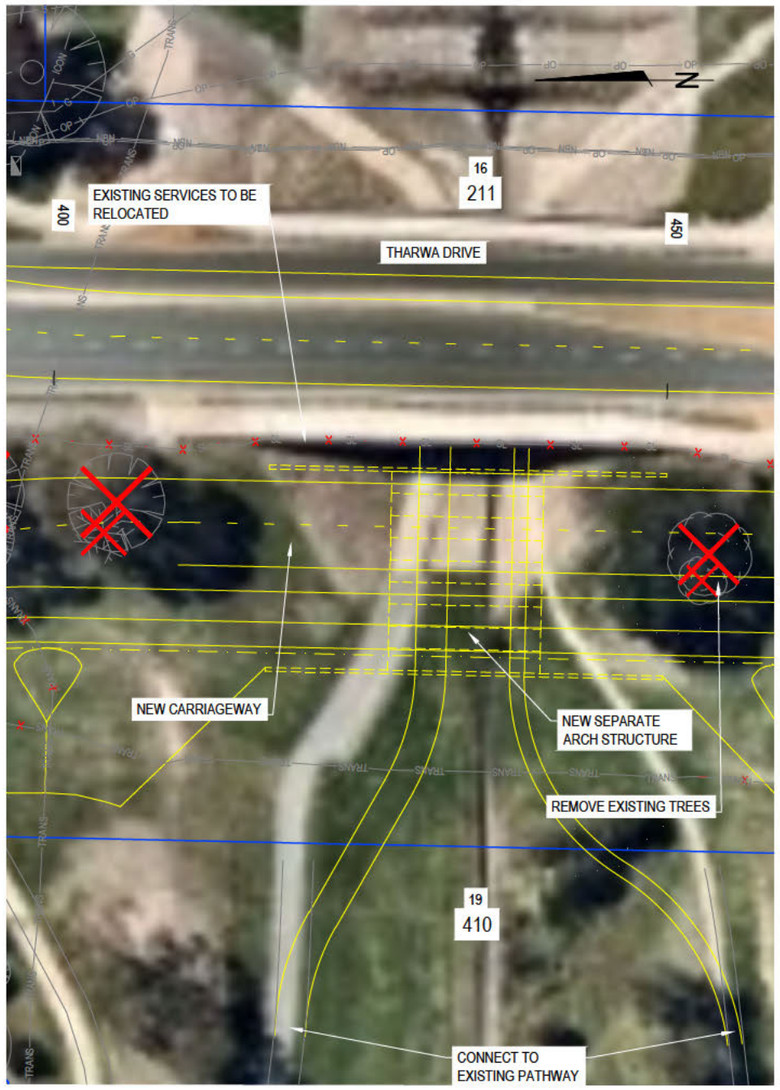
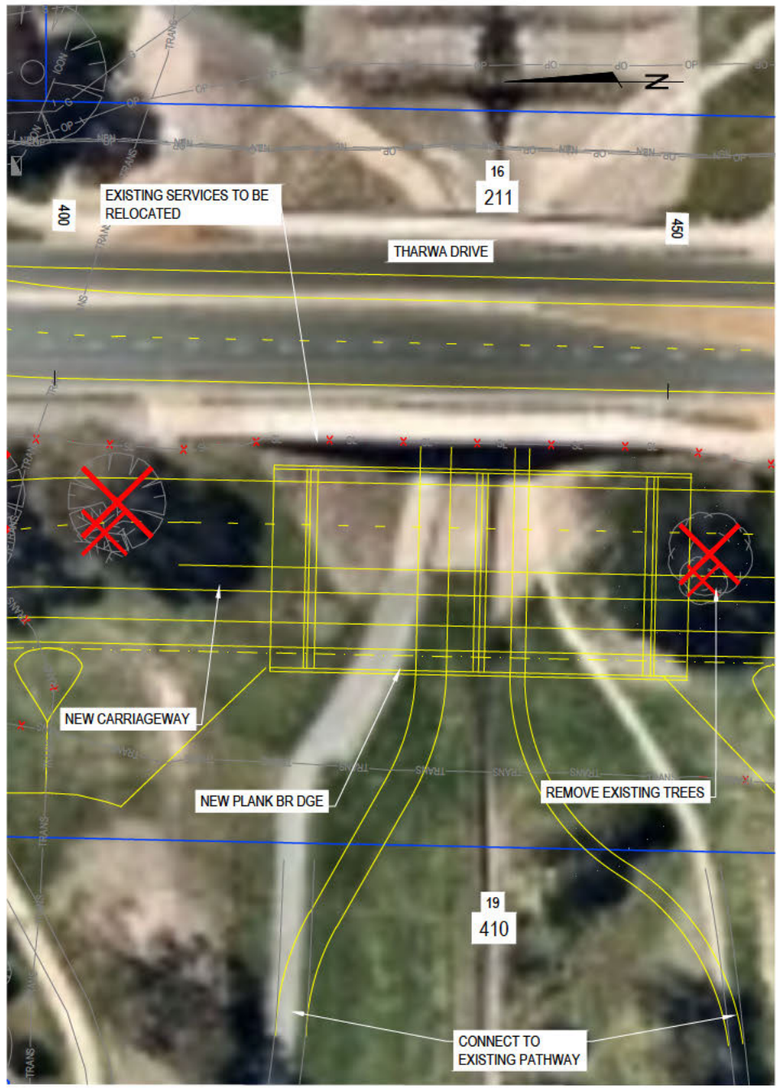


OPTION 1 - EXTEND ARCH STRUCTURE



OPTION 2 - SEPARATE ARCH STRUCTURE



OPTION 3 - SEPARATE PLANK BRIDGE

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS — AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 2.5 5 7.5 10 12.5 15 17.5 20
SCALE 1:250 (A1) SCALE 1:500 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 3

20-000580 104 —

OPTION 1 - DUPLICATION ON WEST SIDE WITH 6m MEDIAN

OPTION 2 - DUPLICATION ON WEST SIDE WITH 8m MEDIAN

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
					15/02/2021

AMENDMENTS — AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 7.5 15 22.5 30 37.5 45 52.5 60
SCALE 1:750 (A1) SCALE 1:1500 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 4

20-000580 105 —

OPTION 1 - LARGER ROUNDABOUT

OPTION 2 - TRAFFIC SIGNALS

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS — AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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THARWA DRIVE DUPLICATION
FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 5
.
20-000580 106 —

OPTION 1 -EXTEND ARCH STRUCTURE

OPTION 2 - SEPARATE ARCH STRUCTURE

OPTION 3 - SEPARATE PLANK BRIDGE

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

AMENDMENTS

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 2.5 5 7.5 10 12.5 15 17.5 20
SCALE 1:250 (A1) SCALE 1:500 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 6
.

20-000580 107 —

OPTION 1 - MERGE BACK TO SINGLE CARRIAGEWAY

OPTION 2 - DUPLICATION ON WEST SIDE WITH 6m MEDIAN

OPTION 3 - DUPLICATION ON WEST SIDE WITH 8m MEDIAN

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
					15/02/2021

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AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 7.5 15 22.5 30 37.5 45 52.5 60
SCALE 1:750 (A1) SCALE 1:1500 (A3)

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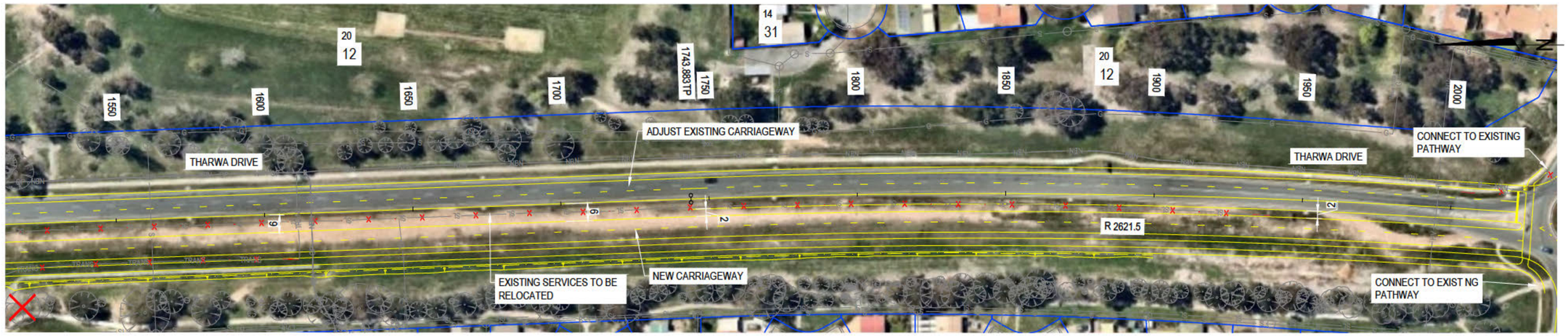
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 7

SHEET 1 OF 2

20-000580 108 —

OPTION 1 - MERGE BACK TO SINGLE CARRIAGEWAY



OPTION 2 - DUPLICATION ON WEST SIDE WITH 6m MEDIAN

OPTION 3 - DUPLICATION ON WEST SIDE WITH 8m MEDIAN

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
					15/02/2021

AMENDMENTS — AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 7.5 15 22.5 30 37.5 45 52.5 60
SCALE 1:750 (A1) SCALE 1:1500 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 7

SHEET 2 OF 2

20-000580 109 —

OPTION 1 - DO NOTHING

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	[redacted]				15/02/2021

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DESIGN OPTIONS STUDY

0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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THARWA DRIVE DUPLICATION
FEASIBILITY STUDY AND CONCEPT
DESIGN

DESIGN OPTION AREA 8 - OPTION 1

20-000580 110 —

OPTION 2 - LARGER ROUNDABOUT

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
					15/02/2021

AMENDMENTS

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0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

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THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 8 - OPTION 2

20-000580 111 —

OPTION 3 - TRAFFIC SIGNALS

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
					15/02/2021

AMENDMENTS

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 5 10 15 20 25 30 35 40
SCALE 1:500 (A1) SCALE 1:1000 (A3)

WAE No. —

ACT Government

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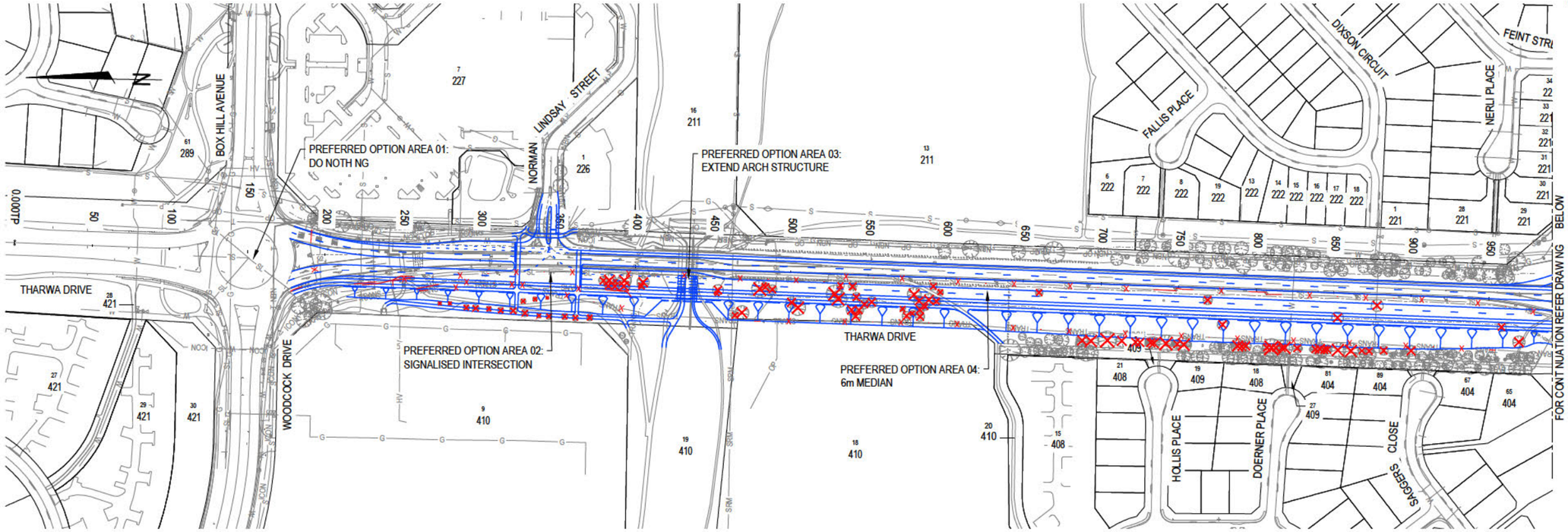
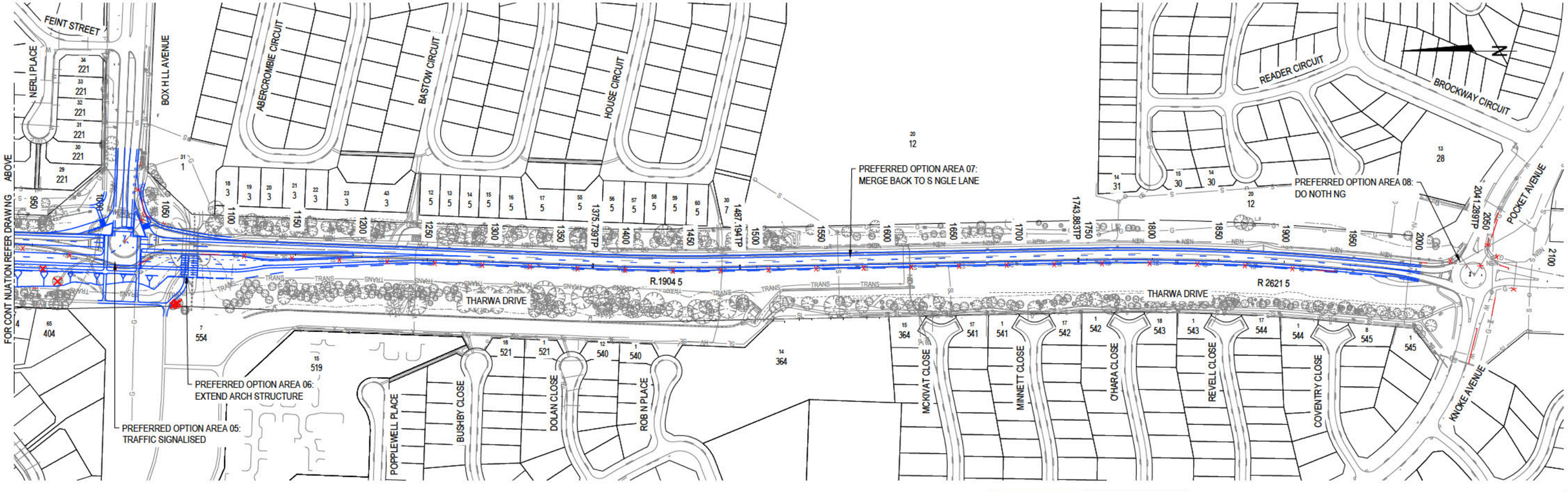
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

DESIGN OPTION AREA 8 - OPTION 3

20-000580 112 —





LEGEND:

- BLOCK BOUNDARY
- PROPOSED DESIGN
- ABANDONED SERVICE
- SERVICES TO BE REMOVED
- EXIST NG NBN
- EXIST NG OPTUS
- EXIST NG TRANS ACT
- EXIST NG TELSTRA
- EXIST NG ICON
- EXIST NG HIGH VOLTAGE ELECTRICITY
- EXIST NG LOW VOLTAGE ELECTRICITY
- EXIST NG STREETLIGHT ELECTRICITY
- EXIST NG GAS
- EXIST NG SEWER
- EXIST NG SEWER RISING MA N
- EXIST NG WATER
- TREES
- TREES TO BE REMOVED

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
[redacted]					15/02/2021

AMENDMENTS

AMENDMENT DETAILS

DESIGN OPTIONS STUDY

0 150 300 450 600 750 900 1050 1200
SCALE 1:1500 (A1) SCALE 1:3000 (A3)

WAE No. —

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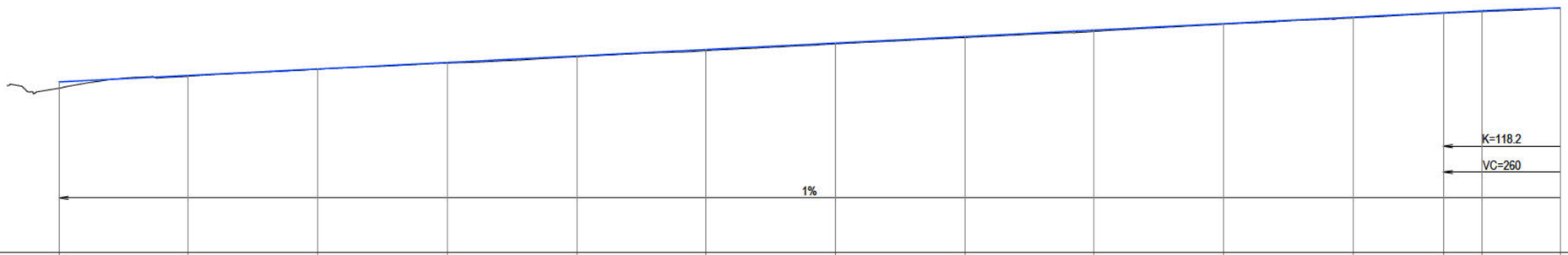
THARWA DRIVE DUPLICATION FEASIBILITY STUDY AND CONCEPT DESIGN

PREFERRED OPTION PLAN

20-000580 150 —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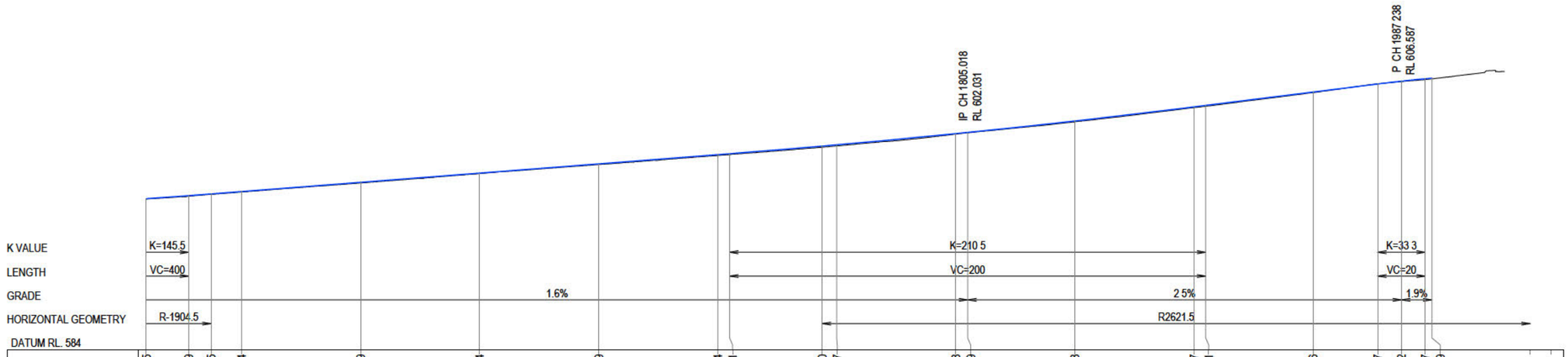
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